An investigation into full cost accounting in a higher education context

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AN INVESTIGATION INTO FULL COST ACCOUNTING IN A HIGHER EDUCATION CONTEXT

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ABSTRACT

This thesis heeds calls for social and environmental accounting researchers to intervene directly to develop new accountings and promote practical change, and to measure the type of change and reasons for non-change using theoretical frameworks.

The thesis first selects and develops an appropriate meta theoretical framework from the social and environmental accounting literature for analysis purposes, drawing on dialogics, organisational change theory and institutional theory, as well as Soft Systems Methodology tools. Existing Full Cost Accounting ('FCA') applications are critiqued using this framework and a utopian vision for a new application is constructed. The thesis then undertakes a new, explicitly dialogic application of Full Cost Accounting ('FCA') in a new sector (Higher Education). It does so following calls in the literature to develop further FCA as a worthwhile technique to correct prices and redress the asymmetry of information found in (un)sustainability reporting, towards something that better demonstrates the (un)sustainability of an organisation's practices. The new application is undertaken in a deliberately dialogic manner as the literature posits that social and environmental accounting engagements incorporating dialogic motifs are more likely to engender change.

Methodologically, the thesis utilises a variant of Action Research, Soft Systems Methodology, to conduct dialogic model building and calculations via learning for action cycles.

The new application is then critiqued using the theoretical framework constructed, in order to answer the objectives of the thesis, which are to: (a) further evaluate the difficulties inherent in the FCA process; (b) determine whether advances in scientific knowledge and sustainability awareness now make FCA calculations more feasible (as compared to previous FCA

applications); and (c) ascertain whether FCA engagements conducted in an explicitly dialogic manner lead to organisational change.

To Penny, Jocelyn and Thomas, and my mother and father, Carol and Julian.

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LIST OF ABBREVIATIONS

AAAJ	Accounting, Auditing & Accountability Journal
AF	Accounting Forum
AOS	Accounting, Organisations & Society
BP	British Petroleum
BRASS	Centre for Business Relationships, Accountability, Sustainability & Society
BREEAM	Building Research Establishment Ltd Environmental Assessment Method
CO_2	Carbon Dioxide
CPA	Critical Perspectives on Accounting
DEFRA	Department for Environment, Food and Rural Affairs
CSEAR	Centre for Social and Environmental Accounting Research
EC	European Commission
ECA	Environmental Cost Accounting
ESDGC	Education for Sustainable Development & Global Citizenship
FCA	Full Cost Accounting
GDP	Gross Domestic Product
GST	General Systems Theory
GIST	Green Indian States Trust
GRI	Global Reporting Initiative
HE	Higher Education
HEFCE	Higher Education Funding Council for England
HEFCW	Higher Education Funding Council for Wales
IIRC	International Integrated Reporting Council
JAPCEA	Journal of the Asia Pacific Centre For Environmental Accountability
LFA	Learning for Action
MNC	Multi-National Corporation
NGO	Non-governmental Organisation
OECD	The Organisation for Economic Co-operation and Development
POWA4S	Prince of Wales Accounting for Sustainability
PwC	Pricewaterhouse Coopers
SA	Sustainability Accounting
SAM	Sustainability Assessment Model
SCC	Sustainable Cost Calculation
SEA	Social and Environmental Accounting
SEA	Socioeconomic Accounting
SIA	Social Indicators Accounting
SME	Small or Medium-sized Enterprise
SRA	Social Responsibility Accounting
SEAJ	Social and Environmental Accounting Journal
SSM	Soft Systems Methodology
TEEB	The Economics of Eco-systems & Biodiversity
TIA	Total Impact Accounting
UK	United Kingdom
UN	United Nations
UNEP	United Nations Environment Programme
USEPA	United States Environmental Protection Agency
WAG	Welsh Assembly Government

CHAPTER 1
INTRODUCTION TO THE THESIS

1.1 Introduction & Rationale

Full Cost Accounting ('FCA') refers to accounting methodologies, approaches, techniques, tools or models[1] developed to measure in common monetary terms the full economic, environmental and social impacts of an organisation's activities including those outside of its usual reporting boundaries (author's definition).[2] Traditional accounting is deficient in this respect as it often fails to recognise all such impacts, even though they lead to costs and/or benefits for stakeholders and unconnected third parties outside of the boundaries of the organisation (for example, see: Messner, 2009; Jones, 2010; and Mattison et al., 2011).[3] As an illustration, the activities of organisations lead to carbon dioxide (CO_2) emissions that have a negative impact on global society through global warming. However, although organisations account for purchase costs such as the cost of car fuel and electricity, these purchase costs (equal to the prices charged by suppliers) will not fully represent the true cost to society of using fossil fuels to run vehicles or generate electricity (Bent & Richardson, 2003). Governments can seek to correct prices and alter behaviour using policy instruments such as green taxes. However, the use of these instruments is still in an embryonic stage (Howes, 2002 & 2003 a&b). It can therefore be concluded that market prices are often incorrect, and this leads to decisions by organisations and individual consumers that are not sustainable for the planet and its life-forms (Bebbington et al., 2001). The consequences of this market failure can be seen in the deteriorating indicators of planetary health presented in the 2011 United Nations Environment Programme ('UNEP') report 'Keeping Track of Our Changing Environment: From Rio to Rio+20' (UNEP, 2011). The OECD 'Environmental Outlook to 2050' report

1 Different authors have used different terminologies. The term 'methodologies' will generally be used in this thesis (unless specific discussions necessitate the use of the original authors' terminologies).

2 The reporting of the three impacts together is often referred to as 'triple bottom line' reporting (a phrase first coined by John Elkington – for example see Elkington, 2003), and is seen as giving a measure of the sustainability of an operation. However, see chapter 2 for a critique of measures of sustainability at the organisational level.

3 Impacts from organisational activity borne by parties outside of an organisation are defined as externalities by economists.

(OECD, 2012) predicts that degradation will continue with significant costs and irreversible changes. FCA therefore aims to correct market prices and hence alter production and consumption decisions.[4]

It might be thought that the ‘information gap’ identified above has already been filled by the recent trend towards voluntary sustainability reporting by organisations, which usually takes the form of a narrative report backed up by a range of (mainly non-financial) key performance indicators addressing economic, social and environmental impacts. The major fault of such reports is that they are unregulated, and as a result they are not produced consistently across organisations despite the existence of best practice guidelines such as those produced by the Global Reporting Initiative (for example see Global Reporting Initiative, 2012) and the Prince of Wales Accounting for Sustainability Group (see Accounting for Sustainability Group, 2007). There is also a risk that the reports present an incomplete picture and are unbalanced, in that ‘good’ news is emphasised over ‘bad’. Further, the users of such reports also often suffer from information overload given the volume of information presented (although the recent trend towards intergrated reporting – see IIRC (2012) – may help). In sum, it can be very difficult to gauge the sustainability (or more likely the un-sustainability) of an organisation by reading its so-called sustainability report. For a damning critique of sustainability reporting, see Milne and Gray (2007).

A school of thought therefore exists that maintains that attempts at monetisation are necessary at the level of the individual organisation to ‘disturb’ the capitalist status quo, however flawed those attempts may be (for example, see Bebbington et al., 2001; Bent & Richardson, 2003; and Howes, 2000). Further, it has been argued that FCA conducted in a dialogic, democratic and participatory[5] form could be a powerful educator and agent of change, especially if monetisation is not absolute, the subjectivity of figures is explicitly acknowledged, and ‘expert’

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[4] There are many tools available that claim to measure sustainability, but only FCA to the author’s knowledge seeks to correct prices directly.

[5] I.E., a form that involves open discussion, and input from (and ownership by) many stakeholders. Dialogic, democratic and participative accountings are discussed more fully in chapter 2.

input is diluted by input from multiple stakeholders (for example see Bebbington et al., 2006).

This thesis takes these premises as its foundations. It begins by reviewing the social and environmental accounting literature, identifying the location of FCA in this literature and selecting appropriate theoretical frameworks (in the areas of dialogics, organizational change and institutional theory) to build a meta-framework with which to critically evaluate extant and new applications of FCA. Existing FCA applications are then summarized and critiqued using these theoretical lenses. Moral, theoretical, technical and practical problems with FCA are highlighted, along with the fact that many applications have not been fully participative. Given these problems, extant applications have been small in number and have tended to be ad-hoc, experimental and incomplete, with little consistency in application. The Sustainability Assessment Model – with a relatively long history of development and application – has started to buck this trend, however, and the most recent applications (Mattison et al. 2011 and PUMA 2011a-j) have also started to amass and use sizeable data sets. Despite the problems generally noted, given its potential to deliver significant perceived benefits, certain commentators have argued that FCA is worth persevering with (for example, see Antheaume, 2007). It has been recognised that FCA is by no means the finished article, and that more development work is required; FCA has been described as an example of a sustainability accounting technique in its metaphorical teenage years (Frame & Cavanagh, 2008). Further, the idea has been floated that scientific advances in measuring impacts (and the increased involvement of markets in pricing the effects of impacts) may make monetisation of impacts more achievable – and hence FCA more successful – as time progresses (Antheaume, 2007). Increased sustainability awareness in general may also encourage greater acceptability of FCA (as compared to when previous applications were undertaken).

This thesis argues that development of FCA requires new applications to be undertaken in new contexts, as the process of ‘trying again’ may lead to a better technique. The thesis proposes that FCA might benefit from using an ‘off the shelf' methodological framework that has not previously been used in a FCA context. Given that commentators have argued that the educational impact of the FCA process (rather than the end figures produced) is its most beneficial output, and that the educational impact is at its most powerful when the process is dialogic, participatory and democratic, then it makes sense to adopt a methodological approach that incorporates dialogue, participation, reflection and learning as standard. It is argued that Action Research is an appropriate research methodology to develop and apply FCA, as it is built on dialogue and democratic participation. In particular, it is argued that Soft Systems Methodology (a variant of action research) should be utilised, as while it contains the standard action research motifs, it casts the process of enquiry as a system and adopts a structured task approach to each stage. It therefore addresses the major criticisms often levelled at action research - that it is unstructured, unscientific, and open to researcher bias – and allows the criteria of 'recoverability' to be satisfied.

It is also proposed that the Higher Education (HE) sector in the UK is a suitable test-bed for a new application of FCA given the current lack of holistic sustainability measurement tools available in the sector. Therefore, FCA should provide useful additional information. A case study organisation that has allowed FCA to be applied to a new campus development ('University X') is then introduced and described, and an illustration is given of how an amended Soft Systems Methodology 'learning for action' cycle has been applied by University X to develop a 'FCA for Higher Education' model. Finally, the outputs produced are critically evaluated against the research objectives using the theoretical frameworks noted above.

1.2 Thesis Layout

The remainder of the thesis is organised into the following chapters.

Chapter 2 reviews the development of the social and environmental accounting and FCA literatures and critically evaluates how FCA methodologies and applications have developed using the meta-theoretical framework noted above. It concludes by arguing that the application of FCA in a new setting is justified, and that a new approach to the development and application of FCA models is required. Expectations for a new application are set as a benchmark: a perfect, utopian application is imagined along with a worst-case scenario and a pragmatic, imperfect scenario.

Chapter 3 documents the research methodology and methods developed for the thesis, based on the findings of chapter 2. Firstly, it describes interim research undertaken to assess the current usage of FCA. Secondly, the use of Action Research and Soft Systems Methodology are proposed. The case study sector and institution (University X) are then introduced and the chapter constructs a dialogic Soft Systems Methodology learning for action ('SSM LFA') cycle to build a FCA model to assess the new campus development of University X. The stages of use of the cycle are critically evaluated.

Chapter 4 analyses the exploratory 'finding out' interviews undertaken at the beginning of the first SSM LFA cycle, assessing both the characteristics of the case study organisation and the sector prior to the action research intervention. SSM tools and organisational change and institutional theory lenses are used. This is undertaken to provide a benchmark in order to determine the level of organizational change that might have occurred as a result of the intervention, and to identify potential institutional barriers that may inhibit the success of FCA.

Chapter 5 presents key empirical outputs of the thesis. Firstly it evaluates the *development* of a 'FCA for Higher Education' model using SSM root definitions. Secondly, it evaluates the *use* of the model – the assumptions behind it, the methods used to gather data and the results obtained when applying it to the new campus development. The chapter closes by linking results to the first two objectives of the thesis. The new model and calculations are deemed to be reasonably successful given the level of participation in building the model and determining impacts, and the fact that the majority of impacts identified were monetised. It is hence concluded that the current state of sustainability awareness and scientific knowledge make FCA applications feasible. However, difficulties that have affected extant applications remain.

Chapter 6 evaluates the findings of post-FCA cycle (post-intervention) interviews and author observations using the theoretical meta-framework in order to determine: the extent to which the whole process is dialogic; whether emancipatory change has occurred; and why such change might have occurred/not occurred. In summary, it is found that the new FCA application contains strong dialogic elements but also non-dialogic motifs, despite being conducted in an explicitly dialogic manner. Further, there is no evidence that the application has led to immediate second-order (morphogenetic) change (per Laughlin's (1991) organizational change framework), although the most recent evidence suggests that the impact might have been more deep-rooted than first thought. Finally, it is concluded that institutional barriers may have contributed to inertia and non-change.

Chapter 7 summarises thesis contributions and implications of the work. It critically evaluates limitations of the research in terms of its design and execution. Further, it makes recommendations for future appliers of FCA. It discusses how the 'FCA for HE' application could have been conducted in a more dialogic manner and suggests how the completeness and accuracy of calculations could have been improved. It also makes recommendations for University X and policy makers and offers some final conclusions/reflections of the author, including suggestions for further research.

1.3 Research Aim and Objectives

The overall aim of the thesis is to investigate the use of FCA in a HE context. The objectives of the thesis are determined at the conclusion of the literature review in chapter 2. The chapter concludes that a new application of a revised FCA model in a new context (via a dialogic approach) is justified, in order to: (a) further evaluate the difficulties inherent in the FCA process; (b) determine whether advances in scientific knowledge and sustainability awareness now make FCA calculations more feasible (as compared to previous FCA applications); and (c) ascertain whether FCA engagements conducted in an explicitly dialogic manner lead to organisational change.

CHAPTER 2: A CRITICAL EVALUATION OF THE SOCIAL AND ENVIRONMENTAL ACCOUNTING AND FULL COST ACCOUNTING LITERATURE

2.1 Introduction (aims and objectives of literature review)

This chapter first sets the scene and provides an overview by looking at definitions of sustainability and sustainable development and the reasons for corporate un-sustainability. It then reviews the development of the social and environmental accounting ('SEA') literature and identifies appropriate theoretical frameworks for critical analysis. FCA's location in the SEA literature is identified and FCA is explored as a possible solution to corporate un-sustainability. The technique of FCA is outlined, arguments for and against FCA are evaluated, and methodologies developed and applications undertaken to date are summarised and critically evaluated using multiple theoretical frameworks. The chapter concludes by identifying opportunities and arguments for further research, which underpin the key research objectives of this thesis.

The FCA literature (as a subset of the wider social and environmental accounting literature) has developed FCA methodologies and has generally described and evaluated FCA 'experiments' or 'applications' at the project, organisational or sectoral level (categorisations used in Xing et al., 2008). However, some of the most recent applications have had an even wider scope, being applied at country or global level (Gundimeda et al., 2005a&b & 2006; Kumar et al., 2006 & 2007; Epstein et al., 2011; and Mattison et al., 2011). Some authors have attempted to provide overviews of the earlier methodologies and applications (for example see Bebbington et al., 2001; Lamberton, 2005; Xing et al., 2006; Bebbington, 2007a; Antheaume, 2007; and Fraser, 2010; also note summaries of/references to FCA in the more general social and environmental accounting literature such as Owen, 2008; Gray, 2010; and Gray & Laughlin, 2012). However, while Bebbington et al. (2001) - a detailed research monologue - is an invaluable pulling together of the issues and covers a great deal of ground, it is now outdated. Further, the Lamberton, Xing et al., Bebbington and Antheaume studies are relatively high level, summary accounts. The review of FCA literature by this author adds to the field as it is comprehensive and detailed. Methodologies and applications are sorted by type, and their development is presented in a diagrammatical and tabular manner. Further, both technical and theoretical lenses are employed for analysis purposes. This level of detail is crucial to provide foundations and material for the new application of FCA that is proposed at the end of this chapter, and which is documented in Chapters 3-6.

2.2 Sustainability and sustainable development

Sustainability has been defined as relating to "the planet and biosphere's ability to renew itself" (Gray, 1992, pp. 416)[6]. Sustainable *development* (author's italics) has been defined as: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland Report, 1987, reproduced in UNEP, 2007, p. 7); "a dynamic process which enables all people to realise their potential and to improve their quality of life in ways which simultaneously protect and enhance the Earth's life support systems" (Forum for the Future, quoted in Howes, 2002, p. 69); and "the journey to a sustainable society" (Baxter et al., 2004, p.1).

Bebbington & Gray (2001) note that the Brundland definition is very general, and it is difficult to determine what it means. To bring some clarity to the definition, Bebbington & Gray state that sustainable development: intertwines social and ecological aspects (as it is "concerned with both the sustenance of the natural ecology and the justice and equity with which the fruits of that ecology are employed" *(p. 560)*, although it is often impossible to distinguish separately such aspects); is centred around humans (it is 'anthropocentric')[7]; and is concerned with both *inter*-generational and *intra*-generational equity (author's italics). Therefore, all people currently living should have the same opportunities, and

6 Gray (1992) also notes that a sustainable activity is one that maintains the planet's capital.

7 This point is also made by Atkinson (2000) - he states that many people have reinterpreted the Brundtland definition of sustainable development as "a requirement to follow a development path where human welfare or well-being does not decline over time" (p. 236).

future generations should have the same opportunities too. Elkington's 'Triple Bottom Line' concept (Elkington, 2003) highlights three strands of sustainable development – economic, social and environmental.

Further, sustainable development has been seen as a middle way between two extreme viewpoints (Rubenstein, 1992). At one extreme lies 'frontier capitalism', where all natural resources are viewed as being available for use by humans. At the other extreme lies a 'deep green' approach that requires restoration of all past degradation. Commentators often present a sustainability 'spectrum' ('strong' sustainability versus 'weak' sustainability), given the lack of agreement on the extent of un-sustainability and its causes (Bebbington et al., 2001)[8]. Mathews (1997) notes a contrast between 'light' and 'deep' shades of green, with the views of managers and accountants at the very 'light green' end. Gray (2010) provides an essay that examines the subtleties, complexities and problems of defining sustainability and un-sustainability. According to Gray, "there are many – perhaps an infinity of – potential states of sustainability" (pp. 56). Gray also notes that a sustainable state will only be achieved via interactions between individuals, organisations, society and states.

2.3 The un-sustainability of global economic activity

Capitalism is not delivering sustainable development in its current format (Bebbington et al., 2001; Bebbington and Gray, 2001; Howes, 2003b; Unerman et al., 2007a; Jones, 2010; and Gray, 2010). Indicators showing worsening planetary and social health (for example the Brundtland Report of 1987, the 1992 Rio Earth Summit, 'Rio+5', and the 2006 Stern Report) are often quoted in the

[8] See Neumayer (1999) for a detailed analysis of both extremes; also note Dresner (2002) who states that "weak sustainability allows human-made capital to substitute for natural capital. Strong sustainability does not" (p. 77). Bebbington et al. (2001) present a number of key questions and answers to illustrate the difference between the extremes. For example, if the question 'what do we wish to sustain?' is asked, weak sustainability would be about sustaining humans, but strong sustainability would be about sustaining other species too. If the question 'what extent of change is required?' is asked, weak sustainability theory would argue that sustainability is achievable via adjustment of the current system; strong sustainability theory would advocate fundamental structural change. These questions and answers were extracted from Bebbington & Thomson (1996), and adapted from Redclift (1987), Gray et al. (1993) and Turner (1993).

literature (see Brundtland, 1987; UN, 1997a&b; Stern, 2006). The 2011 United Nations Environment Programme ('UNEP') report 'Keeping Track of Our Changing Environment: From Rio to Rio+20' (UNEP, 2011) continues to show further degradation of the planet and the OECD 'Environmental Outlook to 2050' report (OECD, 2012) predicts that degradation will continue with significant costs and irreversible changes. The 'Convention on Biological Diversity – Global Diversity Outlook 3' report (CBD, 2010) has delivered the same verdict for biodiversity. In the UK, recently published indicators have also shown declining biodiversity trends (see: JNCC, 2012a; the UK National Ecosystem Assessment ('NEA'), 2011a; DEFRA, 2011a; and Lawton et al., 2010). Per DEFRA (2011a), "although some species ... have shown recovery in recent years, many species, such as birds, butterflies and plants, and habitats, particularly in the wider countryside, show long term declines" (p. 9). To pick just one example, honey bees declined by 23% in Wales (a country that is part of the UK) between 1985 and 2005 (UK NEA, 2011a, p. 65).

Reasons given in the literature for un-sustainability differ depending on which part of the sustainability spectrum commentators sit. At one end, it has been argued by the 'deep greens' (or 'deep ecologists') that capitalism is fundamentally flawed. The deep greens believe that we face fundamental problems that go to the very roots of our society such as over-consumption and growth[9]. Fundamental (not incremental) reform of the economic system is therefore required to achieve sustainable development (Bebbington et al., 2001; Baxter et al., 2002)[10], involving complete dismantlement of the current system and the recognition of the primacy of nature (Gray, Owen & Adams, 1996).

Further along the spectrum, it has been recognised that capitalism should not (or realistically cannot) be replaced, but that it needs to be partially reformed. Information provided by the economic system is incorrect. Prices and costs used

9 Gray (2010) succinctly notes that "the principal probable source of un-sustainability is resource use and waste production – economic activity and consumption in other words" (pp. 59). He then rehearses the well-trodden argument in the literature that corporations – being a central component of capitalism – are one of the central causes of un-sustainability.

10 Also see Puxty (1986 & 1991), Tinker et al. (1991), Cooper (1992) and Everett & Neu (2000).

to make decisions at the individual, entity and macroeconomic levels are wrong, as conventional accounting does not recognise and record all consequences of economic decisions/actions (see Gray, 1992; Rubenstein, 1992 & 1994; Gray et al., 1993; Howes 2000, 2002 & 2003b; Bebbington et al., 2001; Bebbington and Gray, 2001; Bent & Richardson, 2003; Baxter et al., 2002 & 2003; Baxter et al., 2004; Antheaume, 2004 & 2007; Accounting for Sustainability, 2006; Messner, 2009; TEEB, 2008 & 2010a,b&c; Jones, 2010 and Mattison et al., 2011)[11].

As an illustration (first introduced in chapter 1), organisations will account for purchase costs such as the cost of car fuel and electricity, recording the prices charged by suppliers. However, these purchase costs will not represent fully the true cost to society of using fossil fuels to run vehicles or generate electricity in terms of carbon dioxide (CO_2) emissions that have a negative impact on global society through climate change (Bent & Richardson, 2003).

Non-market items without a price are often hidden and ignored (Bebbington et al., 2001; Gray & Laughlin, 2012), and this applies to most natural capital and biodiversity; use and damage are not generally accounted for at the entity level (Howes: 2000; 2002; & 2003b. See also: Gray, 1992; Rubenstein, 1992 & 1994; and Boone & Rubenstein, 1997). The invisibility of eco-system services and biodiversity provided/supported by natural capital has been recognised and tackled by ‘The Economics of Ecosystems and Biodiversity’ (‘TEEB’) project and the UK NEA. See TEEB (2010a) and UK NEA (2011a) for illustrations of values that are usually ignored when making conventional business decisions. Bent and Richardson (2003) highlight that the failure extends to *social capital*. At the macroeconomic level, conventional national economic indicators (such as Gross Domestic Product or ‘GDP’) do not capture the adverse impact that economic activity has on the environmental and social health (Bebbington at el., 2001)[12]. According to TEEB (2008 p. 3), “we are trying to navigate uncharted and

11 The Prince of Wales Accounting for Sustainability project (Accounting for Sustainability, 2006) concludes that organisations are not properly assessing, measuring, costing and reporting the social and environmental impacts of their actions, and that few mechanisms are available to translate sustainability visions into operational realities.
12 However, see later for details of a 2011 UK Government White Paper.

turbulent waters today with an old and defective economic compass". TEEB (2010a) calls for the recognition of the value of biodiversity and eco-system services in national accounts; the Green Accounting for Indian States Project that preceded TEEB attempted to do just that for India (see Gundimeda et al., 2005a&b, & 2006; and Kumar et al., 2006 & 2007).

Authors have explored the consequences of the information gap caused by incorrect or non-existent pricing. At the entity level sub-optimal and inefficient decisions are made that lead to the creation of externalities[13] that erode human, social and natural capital (Howes, 2002); economic and financial benefits may be maximized, but environmental and social costs may be created (Baxter et al., 2004). At the macroeconomic level, incomplete indicators give policy makers incorrect signals when they are assessing economic performance and formulating macroeconomic policy decisions (for example, an environmental disaster that precipitated significant clean-up expenditure would boost conventional GDP) (Bebbington et al., 2001). Thus policy makers may also ignore externalities when seeking to regulate the economy and the entities that operate within it.

As noted in chapter 1, full cost accounting ('FCA') has been identified as an accounting technology that may be able to 'correct' prices, 'disturb' the capitalist status quo and act as a powerful educator and agent of change. The next section will locate FCA in the wider social and environmental accounting ('SEA') literature, ask whether (and under what circumstances) SEA technologies can precipitate organisational change, and identify theoretical frameworks that can identify and predict change or non-change. Sections 2.5 onwards will then return to FCA and critique it in detail, before justifying further research in the field.

[13] Externalities are defined as impacts from individual or organisational activity borne by parties outside of an individual/organisation. Specifically, Boone & Rubenstein (1997) define environmental externalities as follows: "External environmental impacts, or externalities, are effects on the environment and on human health that result from business activities, but are not included in the cost or price of its products and services. These impacts are borne, instead, by individuals or society at large. An externality exists when the following two conditions are present - an activity by one agent causes a loss or gain in welfare to another agent that is not involved in the activity, and the loss or gain of welfare goes uncompensated."

2.4 The social and environmental accounting ('SEA') literature

The SEA literature has developed since the 1970's in response to the deteriorating indicators of planetary and social health noted above. There have been a number of seminal reviews of the field, namely Mathews (1984, 1997), Gray (2002) and Parker (2005). These reviews have been built on by Mathews (2004), Thomson (2007), Deegan & Soltys (2007), Milne (2007), Owen (2008) and Gray & Laughlin (2012). Reviews have sought to 'label' the overall field, categorise it in various ways (for example by research topic, theoretical framework, research method and/or empirical site), and highlight key themes that have emerged over time. Section 2.4.1 below provides a very brief descriptive overview of these areas, in order to provide a background to and context for later critical discussions.

Section 2.4.2 explores whether SEA should be undertaken at all. It highlights the critiques of deep ecologists and critical scholars, including problems of capture and under (or limited) theorisation. These arguments are countered by scholars in the 'mainstream' SEA school who argue that doing something is better than doing nothing; they see organisational and societal change as imperative given the state of the planet. Section 2.4.2 also notes the emergence of critical theoretical frameworks to appraise SEA engagements, mainly developed using dialogic theory.

Section 2.4.3 specifically focuses on SEA technologies and organisational change. It finds that SEA is not leading to emancipatory change at present and notes that a number of authors have called for greater research engagement to engender change, including: research on operationalising SEA; in-depth studies of change focusing on particular organisational empirical sites; active engagement with corporations (including direct intervention of researchers in field organisations and action research strategies involving stakeholders); development of a 'multiplicity' of accountings; and forms of engagement based on challenge, disruption, and interconnected thinking.

Section 2.4.4 addresses the issue of how emancipatory change could be precipitated. It critically evaluates dialogic theory and the calls for it to be used as a way of improving the chances of SEA engagements engendering change. The Sustainability Assessment Model ('SAM')[14] is introduced as a SEA technology with dialogic potential and two theoretical frameworks to evaluate the dialogic nature of a FCA engagement, as applied to the SAM, are introduced and linked together (Fraser's Dialogic Heuristic Framework (2010) and Brown's (2009) framework for a critical dialogic approach).

Section 2.4.5 examines Laughlin's (1991) organisational change theoretical framework as a method of making visible what type of change may have occurred when applying FCA at organisational level.

Section 2.4.6 critically evaluates explanatory theories that have been used in the SEA literature, in order to find a framework that may explain why a SEA technology (and FCA in particular) gains traction in a particular sector.

Finally, Section 2.4.7 proposes that action research is an appropriate research strategy to adopt to undertake a dialogic application of SEA (such as FCA) and builds a meta theoretical framework for analysis of SEA technologies at an organisational level that also incorporates an action research 'learning for action' cycle.

2.4.1 Brief overview of the social and environmental ('SEA') accounting literature

Differing descriptions of the SEA field have been employed. Mathews (1984) uses the umbrella term 'social accounting' to cover four categories. These are: Social Responsibility Accounting ('SRA'), Total Impact Accounting ('TIA'), Socioeconomic Accounting (abbreviated to 'SeA' to avoid confusion with social and environmental accounting, 'SEA') and Social Indicators Accounting ('SIA').

[14] A type of FCA first mentioned in chapter 1

SRA is defined as voluntary financial and non-financial disclosures usually produced by private sector organisations, targeted at a range of audiences and covering both environmental issues (such as pollution) and social issues (such as employee welfare). TIA is akin to FCA – it involves the identification, measurement and valuation of environmental externalities. SEA involves the evaluation of publicly financed projects, and SIA is defined as the measurement of macro social events (such as the effect of national government policies) – a ‘macro’ measure compared to the ‘micro’ SEA. In summary, it could be said that Mathews’ description of ‘social accounting’ is a wide one intended to encompass more that what we might consider to be ‘narrow’ social issues as they are disclosed in company sustainability reports today (for example, the Global Reporting Initiative’s Sustainability Reporting Guidelines ‘social’ indicator category is separate to the ‘environmental’ category). Gray & Laughlin (2012) also use the term ‘social accounting’ in its widest sense, defining it as “the full range of social, environmental, ethical, responsibility and sustainability accounting, accountability, reporting, auditing, investment, costing and management” (pp. 245). However, they note that it might be counterproductive to define social accounting as this might inadvertently limit its scope; Milne (2007) makes a similar point, noting that ‘compartmentalising’ social accounting might have detrimentally affected some of the areas identified by Mathews above. The field has also been described as ‘social and environmental accounting’ (Mathews, 1997; Owen 2008) and ‘social and environmental accountability’ (Parker, 2005). However, in his 1997 paper Mathews cites a *social accounting* definition to govern his social and environmental accounting literature survey: “At the very least, social accounting means an extension of disclosure into non-traditional areas such as providing information about employees, products, community service and the prevention or reduction of pollution. However, the term ‘social accounting’ is also used to describe a comprehensive form of accounting which takes into account externalities.” (Mathews & Perera, 1995 p. 364). Owen (2008) notes with some alarm at the start of his literature review that there appears to be no clear agreement as to what social and environmental accounting research is, before also picking up a wide definition of *social accounting* – this time from Gray (2002). Thomson (2007) refers to ‘sustainability accounting' in his review, which appears as a book chapter in the text 'Sustainability Accounting and Accountability'. While he does not define the term, the introduction to the book (Unerman et al., 2007a) implies that it refers to accounting for social, environmental and economic aspects. In conclusion, the term 'social and environmental accounting' ('SEA') will be used as the standard term throughout this thesis to avoid any confusion with the narrow version of social accounting.

Dillard (2007) labels traditional accounting research as overwhelmingly objectivist and positivist. He notes that in comparison, SEA research has "spanned the spectrum of alternative approaches and theories" (p.39).

Research topics studied have expanded over time. Mathews (1997) identifies eight topics: empirical studies; normative statements (essentially model building or development); philosophical discussion; radical/critical literature; items appearing in the non-accounting literature; teaching programmes and textbooks; regulatory frameworks; and other reviews of the literature. However, Parker (2005) finds eighteen topics (including regulation & international codes & standards, external disclosure, theoretical frameworks, attitudes, and national practices and regulations) and Thomson (2007), with the most disaggregated study, notes thirty one research topics (see Figure 2.2). If one looks for dominant topics, then corporate social/environmental/sustainability disclosures/reporting stands out as consistently popular.[15] Mathews (1997), Gray (2002), Parker (2005), Thomson (2007), Owen (2008) and Gray & Laughlin (2012) all identify disclosures/reporting as a prominent (or in some cases dominant) research area, although in Parker's sample national practices and regulation appear more frequently than reporting. Milne (2007) notes that the area (categorised as 'SRA' by Mathews in 1984) is the only category of Mathews' that has received significant attention from researchers. FCA sits in a subset of the SEA literature that is concerned with the development of new SEA models or technologies, predominantly at the entity level. Model-building started in the 1970's but then

[15] The content, prevalence, quality and location of such disclosures are examined in Section 2.6 below as part of a discussion on whether reporting has bridged the information gap caused by incorrect prices.

petered out and lay dormant until the 1990's (Mathews, 1984; 1997). SEA technology case studies are relatively rare and have not generally been deemed to be successful (Fraser, 2012), and the work conducted on FCA (renamed from Mathews' TIA) remains "rather thin" (Milne 2007, p. 51).[16]

A number of philosophies/theories have been used in the field, although limited or under-theorisation has been noted as a problem (see Section 2.4.2). Mathews (2004) identifies four underlying philosophies that have appeared 'frequently' in the 'social and accounting' (his term) literatures – critical theorists, the social contract, organisational legitimacy (both narrow and wide perspectives) and the business case. Critical theorists and those advocating the need for a business case to act are seen as being at opposite ends of a spectrum. Parker (2005) then identifies nine theories that have been employed in the SEA literature at a philosophical or policy implantation level, which could be seen as relating to and/or being subsets of Mathew's four philosophies. Parker argues that these theories can be grouped together as either 'augmentation theories' or 'heartland theories', depending on whether SEA is seen as something that augments conventional accounting or whether it is seen as being at the heart of dialogue between the organisation and society. The augmentation theories identified are: decision-usefulness theory; economics based agency theory; stakeholder theory; legitimacy theory; and accountability theory. The heartland theories identified are: political economy accounting theory; deep green and social ecology theories; eco-feminist theory; and communitarian-based theory. Thomson (2007) identifies thirty four different theoretical frameworks (see Figure 2.1).

Parker (2005) notes six type of research method employed in the literature: content analysis, case/field/interview studies, surveys, literature reviews/theory/commentary, experimental approaches and combined approaches. Literature reviews/theory/commentary are the dominant methodology over the sample period, appearing in approximately half of the

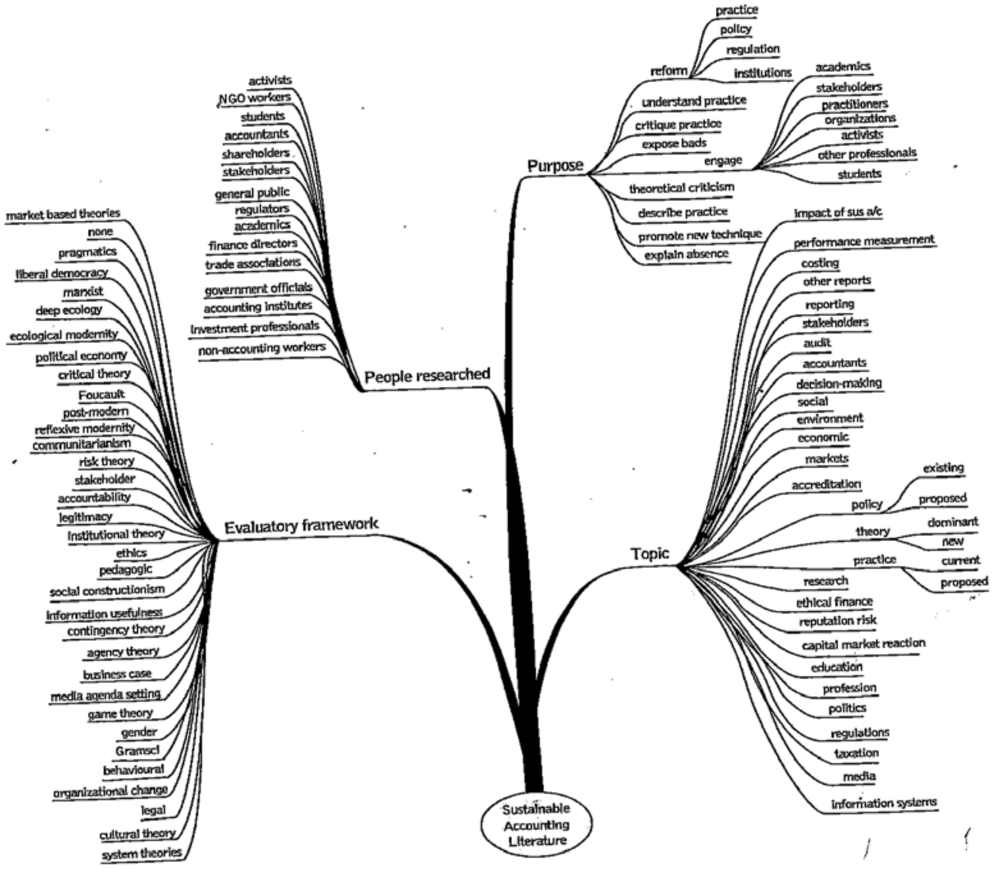
[16] The development and application of FCA is critiqued in detail in Sections 2.5 onwards. While at first glance there appears to be a reasonable number of FCA applications (see Figure 2.4), it is concluded that the majority are ad-hoc and incomplete, which supports Milne's viewpoint.

articles reviewed. Content analysis, case/field/interview studies and surveys take up most of the remainder in roughly equal proportions, although content analysis is used slightly more often and case/field/interview studies slightly less. Thomson (2007) notes 19 research methods including content analysis and case studies (see Figure 2.2); content analysis is found to be more dominant than in Parker's sample.

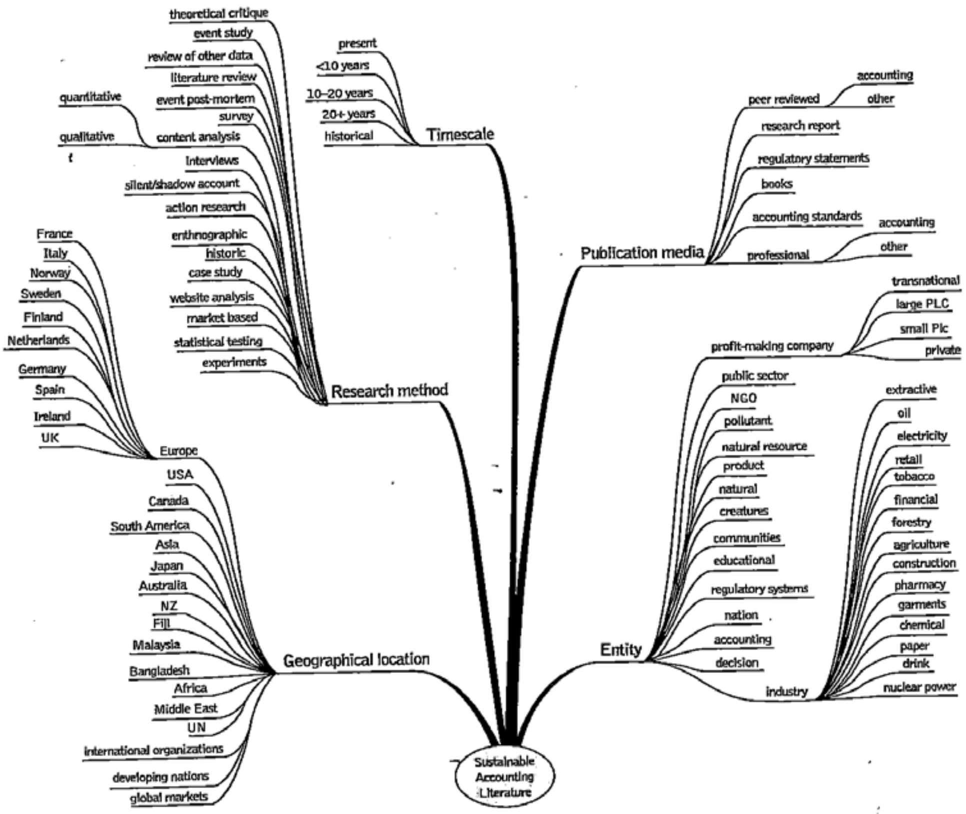
Thomson (2007) notes a significant bias towards research on large plc's when categorising literature by empirical site. This is not corroborated by Parker (2005) as his sample looks at research topics but not empirical sites. However, Owen (2008) notes that "(social and environmental accounting/reporting) research outside the private sector domain is somewhat conspicuous by its absence" (pp. 249). Ball and Grubnic (2007) also note limited public sector SEA reporting to date (as does Milne, 2007) and call for practitioners and researchers to drive forward SEA in this sector. This thesis will make an additional contribution in this area by examining the application of an SEA technology in the University sector in the UK.

<u>Figure 2.1</u> – Conceptual map of sustainability accounting literature (1)

(Source: Thomson (2007), pp. 26)



<u>Figure 2.2</u> – Conceptual map of sustainability accounting literature (2) (Source: Thomson (2007), pp. 27)



2.4.2 *Should SEA be undertaken?*

Georgakopoulos & Thomson (2008) and Fraser (2010) both note that viewpoints in the literature regarding SEA[17] can be roughly categorised into three positions across a spectrum. Firstly, SEA should not be undertaken; secondly, SEA presents a 'win-win' business case as it can lead to better management of social/environmental/sustainability issues and increase financial returns; and thirdly, SEA can illuminate practices and precipitate change inside or outside organizations - it is hence a mechanism of emancipatory change that can create "different sustainability utopias" (Georgakopoulos & Thomson, 2008, p.1119).

Deep ecologist/deep green theorists and eco-feminists (who are concerned about the role of masculinity in the destruction of nature) adopt the first position listed above. They have cautioned against accounting for sustainability per se, arguing that "sustainability will not be achieved by either tinkering with a fundamentally flawed system and/or adding more of the very thing (economic calculative rationalism) that caused the problem in the first place" (Bebbington et al. 2001, p. 29; also see Baxter et al., 2003). Maunders & Burritt (1991) argue that green accounting might do more harm than good. Hines (1991, as paraphrased by Gray & Laughlin, 2012) suggests that "accounting as usually understood, due to its formalisation and its tendency to make the complex simple, abstract and objective, can actually only ever destroy the delicate beauty of nature and living" (pp. 231). Cooper (1992) also argues against accounting for the environment. Lehman (1995, 1999 and 2001), constructing a communitarian-based theory, argues that organisations cannot be a base on which to build an accountable society. According to Lehman, accounting should be a wide, moral discourse allowing exposure and transparency, maximising the good of the entire community and balance competing claims.

[17] Fraser (2010) refers to sustainability accounting.

Critical theorists (for example, see Everett & Neu, 2000; Tinker et al., 1991; and Puxty, 1991)[18] have also attacked mainstream SEA research, for engaging with yet not influencing and altering the behaviour of the powerful capitalist/managerialist status quo. Engagement is seen as dangerous as it reinforces the existing dominant position. Critical theorists have also expressed concern about capture of the field by business and other organisations (Mathews, 2004; Parker 2005) and evidence of capture has been provided in a number of studies (for example, see Tinker & Gray, 2003; O'Dwyer, 2003; Bebbington, 1997; and Tregidga & Milne; 2006). Larrinaga-Gonzalez & Bebbington (2001) develop a two-position heuristic to highlight how SEA technologies might precipitate (or not precipitate) change within organisations, and their first position (based on critical theory) is one of *institutional appropriation*. This position recognises the risk of capture and suggests that substantive change is unlikely as a result[19]. Archel et al. (2011) back-up the arguments of the critical school in a study of Spanish government-led consultations on CSR measures. They find that the involvement of stakeholders in the consultation process who can never win the arguments against dominant actors who espouse 'business as usual', weak sustainability arguments simply legitimises a process that ultimately embeds further these weak sustainability ideals. Finally, Fraser (2010) notes that critical theorists have criticised authors who have developed, applied and evaluated new SEA technologies for under-theorisation (Neu, Cooper & Everett, 2001; Tinker & Gray, 2003; Gray, 2002) – a charge that he seeks to rectify with his own work (which will be detailed below).

Thomson (2007) also notes that many SEA studies have been descriptive with no explicit use of a theoretical framework. This could be due to the pragmatism shown in the field; SEA researchers want to get their hands dirty (Gray, 2002, cited in Dillard, 2007); as a result, "practitioners...seem more intent on action

[18] Per Dillard (2007), critical theory (which emanates from Marxist scholars) encourages critique which "leads people to understand and live in more enlightened ways" (pp. 38). Deeper understanding brings enlightenment, empowerment occurs when this deeper understanding is conveyed to the wider community, and emancipation (equal rights/status) is brought about by the action of enlightened members of the community. The critical accounting project is characterised by calls for "radical politically motivated change" (p. 49).

[19] The alternative position presented by Larrinaga-Gonzalez & Bebbington is one of *organisational change*, which posits that accounting can be used to improve sustainability performance.

than theorising" (Dillard, 2007, p.37). Further, when theory is applied it is often limited. For example, both Gray & Laughlin (2012) and Owen (2008) criticise the reluctance of most researchers to use anything other than legitimacy or stakeholder theories to explain reporting motives and behaviour. Consistency of theoretical development has also been seen as a problem. Thomson (2007) notes a lack of engagement with prior research, in that new theories are introduced that do not link back to previous research. Parker (2005) cites Adams (2002), who states that many theories have been developed without engaging with organisations that undertake social and environmental reporting. As a consequence, theories only provided partial and limited explanations for observed social and environmental reporting. Further, the majority of theorising is deductively derived, and no serious attempt has been made at inductive theorising from field derived data. Per Thomson (2007), the field is not coherent, and does not have a common conceptual framework. He suspects that this is due to the practice of seeking 'deliberate difference' rather than a 'persistent rigorous discourse'. As a consequence, "rigorous problematisation and reflection of key thematic issues" (p. 34) is absent. However, Parker (2005) notes that while a number of theories had been employed in the literature, pluralism is good – all theories are valuable. An "all-encompassing unitary explanatory theory" (pp. 849) is a 'mirage' that could not deliver the richness of insights required. Bebbington (2007b) argues that theoretical frameworks need developing to analyse organisational change resulting from SEA, as accountability, legitimacy or stakeholder theories may not be sufficient for this purpose. For example, legitimacy theory predicts that pressure may lead to reporting, but reporting can signal change or the absence of change. She therefore suggests that other theories such as institutional theory could be further developed and used for analysis. Brown (2009) notes that "the field has been inadequately theorized to cope with difference and diversity" (p. 314). Institutional theory will be explored in Section 2.4.6 below and it will be argued that it is an appropriate theory to explain organisational attitudes towards FCA.

A number of authors who sit in the second and third positions identified by Fraser (2010) and Georgakopoulos & Thomson (2008) have countered the 'don't do

SEA' position. Gray (1992), Bebbington & Gray (2001) and Bebbington et al. (2001) all recognise the argument that it could be dangerous to attempt to account for such a complex issue as sustainability. However, they conclude that pragmatically working within the system (i.e., using accounting techniques to obtain some measure of sustainability or un-sustainability) might achieve some degree of reform of the system and aid sustainable development. Indeed, Bebbington et al. (2001) states that this is the only realistic way forward given the bias of Western organisations towards 'weak' sustainability[20], and indeed the attitude amongst business and government elites that the system as a whole (i.e., capitalism) cannot be questioned[21]. They do however raise the hope that performing work within the system might illustrate the limitations of doing so and so promote potentially more radical agendas. (Further arguments specific to FCA will be examined in Section 2.9.)

Gray (1992) argues that as business organisations control much of the world's industrial capacity and have been linked with environmental degradation (see also Lamberton, 2000 and Mattison et al., 2011), then they must be part of the solution (i.e., some attempt should be made to calculate sustainability at corporate level). Further, Gray envisages that such a project would complement rather than substitute the measurement of sustainability at other levels. Bebbington & Gray (2001) note that sustainability is a global concept, ideally left to states and peoples. They initially argue, however, that sustainability should be measured at the level of the individual organisation in order to prove the un-sustainability of business practices (given that 'business' is powerful and that it makes contested claims that it is already sustainable[22]). Importantly, this view is amended by the end of their paper once the results of their Landcare Research FCA experiment (the subject of the paper) have been reviewed; given the

[20] This bias is noted in research documented in Bebbington & Thomson (1996) and Bebbington (1999). Bebbington et al. (2001) also quotes work by Mayhew (1997) and Hildyard (1993) which shows how the focus on weak sustainability has been maintained.

[21] Bebbington et al. (2001) notes critiques of the Rio Earth Summit by commentators such Hildyard (1995) (who argues that the summit did not get to the heart of the issues and failed to examine key structural features of un-sustainability) and Grubb et al. (1993) – possible evidence of a hegemony by intransigent elites (author's view). Further, Bebbington et al. notes lobbying by the International Chamber of Commerce that resulted in 'watering down' of FCA proposals in summit documents.

[22] These 'compelling reasons' are echoed in Gray (2010).

difficulties encountered, Bebbington & Gray conclude that it is more appropriate to measure corporate *un*-sustainability (author's italics). Gray & Milne (2002 & 2003), Milne (2007), Milne & Gray (2007) and Gray (2010) all repeat the argument that sustainability is a global concept, and they note that a complex web of interactions makes the measurement of sustainability at the level of the individual organisation impossible. They conclude that sustainability reporting makes no sense at the entity level, but they also concede that it might be possible to estimate how un-sustainable an organisation's activities are. However, Gray (2010) notes that there can be no one answer (given the fact that there are many states of sustainability, as noted earlier): "(we) repudiate any notion of there being any possibility of 'a' or 'the' account of organisational sustainability. There can only be a plurality of such things and, on balance it seems, a plurality of narratives of unsustainability." (The issue of multiple narratives is seen as critical for dialogic forms of accounting, which will be explored in Section 2.4.4.)

Per Fraser (2010), SEA researchers want to influence people and organisations, and this has driven the development of experimental SEA technologies (p.4). This school of thought fits with the alternative heuristic position presented by Larrinaga-Gonzalez & Bebbington (2001) - *organisational change* – which, as noted above, posits that accounting can be used to improve sustainability performance at the organisational level. However, as also noted above SEA technology case studies are relatively rare and have not generally been deemed to be successful (Fraser, 2012).[23]

Gallhofer (1992, in a reply to Cooper, 1992) notes that there are risks in not attempting to account for the environment as it will give destructive forces free reign. Parker (2005) picks up the same theme; he states that 'heartland theory' scholars (such as those who advocate communitarian-based and deep

[23] Fraser (2010) notes that there is debate about how organisational change should be brought about. Whereas SEA scholars argue that enough change can be brought about with a series of small changes (Larrinaga-Gonzalez and Bebbington, 2001) others (for example Spence, 2007) argue for much bigger structural change. This mirrors the debate above on whether capitalism can be amended or requires wholesale replacement.

green/ecology theories) leave him “wanting for implementable strategies and suspicious that the enemy (whatever their identity) may be left to ride unchallenged across the battlefield while we discuss the initial pre-design criteria for a better bow and arrow” (pp. 849). Mathews (2004) notes that while critical theorists often produce strong rhetoric, their theory does not often lead to plans for improvement.

Parker (2005) tackles the issue of capture of the field by questioning whether there are viable alternatives to engaging with organisations. While he recognises that there are a number of theoretical frameworks that predict and explain capture (such as legitimacy and institutional theories), he asks - if you exclude business, government and the third sector from implementation of social and environmental accountability, how will things change? Further, if academics do not engage, how can they exert influence? Parker concludes that managerialist engagement is necessary given the state of the commercialised world. Encouragingly, Parker cites Bebbington (1997), who argues that “capture of the SEA agenda has not been complete and that environmental reporting (being one example of a SEA technology) has the potential to change power relationships and create conditions for different dialogues and accompanying changes in practice.” (p. 850)

The criticism of critical theorists, deep ecologists/deep greens, eco-feminists and those espousing communitarian-based theories has forced mainstream SEA to develop into a more radical field (Owen, 2008; Gray & Laughlin 2012). Critical theoretical frameworks have begun to be developed (for example, see Larrinaga-Gonzalez & Bebbington, 2001; Bebbington & Thomson, 2005; Bebbington et al., 2007; Brown, 2009; Fraser, 2010 & 2012) and some engagements have been viewed through these critical lenses. In particular, dialogic theory has been utilised given its potential to neuter power, surface hidden perspectives, include multiple viewpoints and lead to transformational change (which therefore addresses some of the concerns of the critical and other scholars above). There has been a coming together (of sorts) of the critical and mainstream schools; Dillard (2007) cites Gray (2002), who argues that critical theory empowers SEA and that SEA is compatible with critical theory. Owen (2008), citing Cooper et al. (2005), notes that critical theorists have become more interventionist and that Tinker & Gray's (2003) paper appears to sanction such a move.

2.4.3 SEA technologies and organisational change

The above section has highlighted, through the heuristic of Larrinaga-Gonzalez & Bebbington (2001), that SEA technologies may or may not precipitate organisational change. The evidence in the literature suggests that while these technologies may lead to some change, fundamental, emancipatory change has not been forthcoming to date.

Per Bebbington (2007b), SEA interventions have led organisations to make 'relatively minor' improvements in eco-efficiency that correspond with the win-win business case (for example see Bebbington et al, 2001; Bebbington & Gray, 2001). Further, she argues that environmental disturbances have led to changes in some aspects of operations, including accounting and reporting. However, Bebbington finds no evidence of organisations fundamentally changing their underlying attitudes/rationale in the magnitude required by the deep green theorists. Bebbington therefore concludes that change for sustainable development is not occurring at present (eco-modernist viewpoints hold sway) and that the power of accounting and reporting to induce and reflect such changes might be minimal. She does not suggest that change is not possible; she does however acknowledge that any change timeframe is likely to be considerable (which suggests the need for longitudinal studies).

Owen (2008) criticises SEA to date for not bringing about real change to organisational behaviour, even via practical engagement[24]. In an earlier essay in 2007 Owen cites Dey et al. (1995), Dey (2000) and Bebbington & Gray (2001) as examples of engagement that have failed, and this is echoed by Fraser (2012).

[24] Milne & Gray (2007) also note that SEAR has caused little change to organisational behaviour, although researcher engagement has helped (Adams & McNicolas, 2007)

Fraser (2010, p.38) synthesises the examples of change arising from the applications of the SAM variant of FCA detailed in Bebbington (2007a). While he does not find fundamental change, he notes that the application of the SAM did lead to discussions ('broader conversations') that: highlighted the inter-relationships between different strands of sustainability (environmental, economic, social); brought differences in the way that people thought to the foreground; changed the way that people thought (both about a project and the interaction between the organisation and wider society); and changed the way that they acted, with projects being reconceptualised. Bebbington clearly notes in her original book (Bebbington, 2007a) that perceptions were altered.

Fraser (2010, 2012) has conducted the most extensive and recent study into the changes that the use of a SEA technology (specifically the SAM, a variant of FCA) can engender at the organisational level. Fraser's PhD thesis (2010) studies multiple applications of the SAM across two organisations in New Zealand (a City Council and a social housing developer) in order to determine whether the SAM is able to "foster more critically reflective organisational accounts in the pursuit of sustainability" (p.12). Recognising that theoretical frameworks to evaluate the effectiveness of SEA technologies have been under-developed to date (with the result that existing studies have not given enough detail on the 'how' and 'why' of change), Fraser uses two frameworks in his study to analyse the SAM applications. Firstly, a descriptive organisational narrative is constructed using Laughlin's (1991) organisational change framework (recognised as a middle-range skeletal theory). This gives an account of how the SAM is applied and makes visible what type of change may have occurred (note: this account was published in Fraser, 2012 for the SAM applications undertaken by the City Council). Fraser then constructs a Freirian dialogic heuristic framework ('DHF'), which is based on a previous paper by Bebbington et al. (2004) and also draws on the dialogic theorisation in Thomson & Bebbington (2004; 2005). Fraser applies the DHF to his organisational narrative to evaluate the effectiveness of the SAM and provide more insight into how change occurred. Fraser notes that a Freirian evaluation framework has only been applied in limited circumstances in the SEA literature to date (Bebbington et al. 2007;

Thomson & Bebbington, 2005; Coulson & Thomson, 2006; Thomson & Bebbington, 2004; O'Dwyer, 2004)[25] and not in an empirical organisational setting. The use of the DHF is justified given the identification of the SAM as an accounting technology with dialogic potential (explored in Section 2.4.4), and criticisms of the Laughlin framework used in isolation. (Per Fraser (2010), Laughlin's framework can be criticized as: it can be difficult to distinguish between the two change states (Broadbent & Laughlin, 2005); it may be problematic if empirical sites are static (Larrinanga-Gonzalez & Bebbington, 2001); and it does not give enough prominence to human agency (Kirkpatrick & Ackroyd, 2003)).

In summary, Fraser's study (2010) found the following. Use of the SAM was precipitated by legislative disturbances. Further, applications (particularly the early applications) showed dialogic motifs. For example, they: illuminated organisational and individual beliefs regarding sustainability, and allowed the challenging of these beliefs; allowed the problematisation and reconceptualisation of issues; allowed a wider group of stakeholders to take part in project decisions; and changed project decisions (in the case of a closure of a community garden). However, in both case study sites, a secondary disturbance occurred (a new CEO) that affected subsequent use of the SAM and caused a discontinuation of usage in one case (a new civic building project). The SAM was challenged by senior management and applications became much less dialogic; significant, second order, morphogenetic change (change to organisational beliefs, values, mission and overall raison d'etre) did not occur. Fraser concluded from both cases that the progress of the SAM was entirely people dependent. In conclusion, Fraser's work significantly builds on the study of the application of FCA at the organisational level by (a) examining the types of change precipitated (through use of Laughlin's framework) and (b) asking whether change is good or real change (by examining the dialogic nature of the applications, where 'dialogic' is a proxy for 'good' or 'real' change). However, Fraser does not link his findings to explanatory theories. Section 2.4.6 of this thesis will attempt to do that.

[25] Fraser does not recognise Brown's (2009) theory building

All of the above studies imply that SEA is not leading to emancipatory change as per the third position noted in Section 2.4.2. A number of authors have therefore called for greater research engagement to engender change. Mathews (1997), Gray (2002) and Parker (2005) all conclude their reviews of the SEA field by calling for greater research engagement with practice and policy. According to Parker, research on 'operationalising' SEA (such as Jones, 2003, discussed later in this literature review) does not appear often enough in the literature, and that researchers are "stuck in theorising and observational roles" (pp. 851).[26] Bebbington (2007b) reports a lack of studies of change focusing on particular organisational empirical sites and calls for in-depth, sustained case studies of 'change moments' (p. 236). She also notes that researchers are not often active in initiating change[27].

To offer a solution to SEA non-change, Owen (2008) cites Hopwood (1985), who calls for action research strategies to involve "concerned user groups", and argues that to engender change researchers should work with a wide spectrum of stakeholders and not just managerial interests who tend to try and prove that sustainable development is compatible with 'business as usual'. Owen notes that very few studies have engaged wider stakeholders (with the exception of O'Dwyer, 2005 and Deegan & Blomquist, 2006). (However, any increased involvement of stakeholders should be treated with caution. Messner (2009) notes that stakeholder dialogue might only serve the purpose of making corporations *appear* responsible. This theme is also picked up in the Archel et al. (2011) study noted earlier.) Hopwood's call for action research will be picked up in Sections 2.4.7 & 2.13.

Gray & Laughlin (2012) are more upbeat re engagement and change; they recognise an 'explosion' of fieldwork that has 'energised' the literature. Per Gray & Laughlin, fieldwork has "increased the understanding of the forces and impediments around adoption of social and environmental issues within

[26] Parker (2005) and Owen (2008) do however note encouraging upward trends in case/field/interview studies.

[27] Gray & Laughlin (2012) note that 'new accountings', as called for by Gray (2002), often emerge through direct intervention of researchers in field situations, which implies that researchers should get involved.

organisations” and has “offered insights into how the discourse around social and environmental issues is managed and how the ‘art of the possible’ can be increased at the margins” (pp. 238). They do however argue that there has been an overwhelming concentration in the SEA literature to date on accountability and audit, with the result that inter-connections with other key areas (the survival of the planet and species, regulatory regimes and actions by corporations) had been under-examined. Existing research had been narrow and had not taken up wide viewpoints/systemic thinking. They argued that SEA should be part of a complex and interconnected system and that a ‘multiplicity’ of accountings should be developed, with an avoidance of “the myopic, isolated and colourless concentration on descriptive studies of social (and environmental) accounting practice (related to accountability and audit) which have dominated research over the last twenty years”. (pp. 241). Gray & Laughlin advocate new forms of engagement based on challenge, disruption and interconnected thinking, and active engagement with regulatory processes and corporations.

2.4.4 Dialogic theory and SEA

Given the absence of change noted above, dialogic theory has been championed in the literature, both as a means of *conducting* SEA engagements (including FCA) that may lead to emancipatory change and *evaluating* whether engagements undertaken have precipitated such change (which is deemed to be ‘real’ and ‘good’ change per Fraser, 2010). Traditional accounting could be described as being technocratic, positivistic and monologic[28], a description that extends to most forms of cost-benefit analysis and existing attempts at new SEA tools (Brown & Frame, 2005). The problems inherent in this approach have been highlighted in critiques of cost-benefit analysis by Brown & Frame (2005). In response to these issues, dialogic and participatory ‘accountings’ (and dialogic accounting tools) have been called for in the accounting and other literatures (see Brown (2009) for examples drawn from the accounting, social science, ‘hard science’ and ‘post-normal science’ literatures). Bebbington et al. (2007) argue

[28] … in that it seeks to provide definitive answers (within the bounds of materiality) based on prescribed standards and practices, and discourages the notion that there might be a number of valid answers

that SEA research engagements incorporating dialogics are likely to be more successful than traditional approaches in stimulating emancipatory and sustainable social and environmental change. Brown and Frame (2005) give some explanations for this. They highlight the potential for dialogic processes to force critical reflection on the un-sustainability of organisational practices, expose the value-laden nature of traditional decision-making models, facilitate stake-holder dialogue and to help to make decision-making more open and transparent.

Given the lack of change noted earlier, dialogic applications therefore have considerable appeal. However, the SEA literature has mainly concentrated to date on theorising dialogic approaches to SEA rather than applying them. Thomson & Bebbington (2004) explore a dialogic approach to accounting education; Bebbington et al. (2004) construct a heuristic framework that highlights the attributes of dialogic and non-dialogic accounts; Thomson & Bebbington (2005) use Freire's distinction between 'banking' and 'dialogic' education as a heuristic to examine SEA reporting; Bebbington et al. (2007) build dialogic principles that could be applied to SEA engagements; and Brown & Frame (2005) and Brown (2009) build a critical dialogic approach and illustrate this using the SAM. Only Fraser (2010) makes an application to empirical cases, developing Bebbington et al.'s (2004) framework to critically evaluate multiple applications of the SAM.

The suggestions for dialogic approaches in the SEA literature have been built around an evaluation of the works (in the main, although not exclusively) of dialogic theorist Paulo Freire and ecological economist Peter Soderbaum.[29] Freire's work began in Brazil, where he developed an approach to teach people how to read and write. He was motivated by a desire to improve people's participation in democracy as people who could not read or write were precluded from voting (Thomson & Bebbington, 2005). Freire posits that education can have three roles (Thomson & Bebbington, 2004, pp. 611): telling us what we

[29] For example, Söderbaum 1982, 1987, 1990, 1992a-b, 1993, 1999a-c, 2000, 2001, 2004a-c and particularly 2004d, and Freire 1970, 1994 and 1998 are cited.

know about the world; maintaining existing power structures and hence control over the population; or a transformative role that enables people to form and share worldviews which can lead them as a result to change the world. Per Freire, education thus has both enabling and constraining (or limiting) possibilities. An education that maintains existing power structures (deemed to be a 'banking form of education by Freire) is conservative and seeks to preserve the status quo and something known as the 'hidden curriculum' (Thomson & Bebbington, 2004). The hidden curriculum (Illich, 1971) represents knowledge about roles in society that is implicitly imparted during the educational process. Banking education is characterised by the teacher, as the recognised expert, unquestionably imparting correct and objective knowledge to students (Thomson & Bebbington, 2005). The knowledge is "motionless, static, compartmentalised and predictable" (Thomson & Bebbington, 2005, pp. 514) and students become "passive, patient, listening recepticles" (pp. 513).

In contrast, transformative education – which is undertaken in a dialogic manner - sees a teacher posing problems for his/her students, problems that affect the lives of the students and which can ultimately lead to change (Thomson & Bebbington, 2005). 'Dialogic' refers to two-way dialogue, with knowledge not just being disseminated one-way from a recognised expert. Freire's dialogic education involves a teacher learning from the process and students getting involved in teaching as well as learning (Bebbington et al., 2007); the relationship between teacher and students is therefore an active one (Thomson & Bebbington, 2004) with joint responsibility for learning (Thomson & Bebbington, 2005). Bebbington et al. (2007) use the example of the on-line encyclopaedia Wikipedia to illustrate a dialogic process, as knowledge in Wikipedia is "added to by anyone who chooses to join the discussion" (pp. 358). They also define a dialogic-informed *engagement* as one that involved "iterative mutual learning processes designed to promote transformative action" (pp. 357). The whole process is deemed to be reflexive, and reduce power differentials (Thomson & Bebbington, 2005).

Bebbington et al. (2007) summarise Freire's dialogic *educational process* (author's italics) as follows. They note that the process is built around conscientization, where people become aware of social reality in a dialogic manner, working in groups to highlight different worldviews. Conscientization, which is used to "overcome oppressive forces" (pp. 364) involves: exposing factors that have been hidden or muted[30], and reflecting on them; the gaining of new understanding of situations, and the re-examining of those situations; the problematization of those situations as 'limit situations' (which, per Thomson & Bebbington (2004), involves asking questions and calling into question with a challenging attitude); re-presenting and re-narrating (a 'reconceptualisation' per Fraser, 2010); and the identification of solutions. This process then leads to praxis, a term coined by Freire that means action and reflection. Bebbington et al. (2007) note that the whole process does not privilege one worldview over another; commonalities are sought, with people with opposing worldviews all learning and seeking an improved outcome. The whole process can be simply summarised as: the identification of a limit situation; dialogue; and praxis.

Bebbington et al. (2007) synthesise a large volume of literature to distil the motifs of a dialogic *engagement* (again, author's italics). Dialogic engagements are deemed to be those that: (a) allow possibilities for human agency[31]; (b) recognise heterogeneity of discourse, as opposed to situations where those in power might privilege some discourses and silence others; (c) recognise complex, multi-layered communities and different personal identities; (d) make reference to context and power dynamics (it is recognised that powerful groups might be able to influence what is deemed a 'normal' or accepted view, but their ability to do so depends on context)[32]; (e) involve participatory institutions, deliberative democracy[33] and 'dialogic authority' (where the objectives of all participants are reflected on, on an on-going basis); (f) are multi- or poly-vocal; and (g) un-

[30] Thomson & Bebbington (2005) talk about the process illuminating "previously inconspicuous phenomena" (pp. 514).

[31] I.E., human action and endeavour

[32] Bebbington et al. (2007) also note that given power dynamics, regulation may be required to "create dialogic entitlements" (pp. 369)

[33] Per Brown (2009), deliberative democracy involves the reaching of rational consensus following deliberation.

privilege the role of ‘technical’ experts (while experts that are skilled in sustaining dialogic processes are valued more traditional ‘technical’ experts are cast as learners who do not know everything, and who should ensure that non-experts can contribute, understand and be heard). Such engagements are socially constructionist in nature as people are viewed as constructing their own realities.[34] Bebbington at al. (2007) argue that the motifs identified could successfully be applied to SEA, and give the example of ecological footprint analysis as a tool with dialogic potential that could ‘disturb’ and ‘problematise’ the normal narrative of eco-efficiency and unmask power issues. They also state that including a researcher within an organisational process opens up dialogue; even if it only allows people to explain why the organisation is as it is, it is a way of illuminating previously hidden worldviews and commitments. (As highlighted previously, Gray and Laughlin (2012) note that many of the examples of ‘new accountings’ have emerged when researchers have intervened directly in fieldwork.) Action research will be proposed later as a means of ensuring that a researcher is included in the organisational process.

Fraser’s DHF (as adapted from Bebbington et al., 2004) attempts to transfer the motifs above to an organisational engagement context. The DHF highlights attributes of two polar extremes – a dialogic and a non-dialogic account, as shown in Table 2.1. Bebbington et al.’s (2007) motifs are represented directly or indirectly. For example, heterogeneity of discourse is recognised by DHF attributes 3 and 4 and multi-layered communities and different identities links to attribute 5. Power dynamics are recognised in attributes 1, 5, 6 and 9. Fraser (2010) uses the DHF to illustrate what a hypothetical dialogic SAM might look like, versus a non-dialogic SAM. (Rather than producing a separate table to illustrate this, this author has added examples in each column.) Fraser (2010) then uses the DHF to re-analyse a narrative constructed using Laughlin’s organisational change framework for a number of real SAM applications. The re-analysis highlights aspects of human agency, and both dialogic and non-dialogic

[34] Similarly, Fraser (2010) notes that Freire’s notion of transformation is based on four key themes: the potential for human agency; a social constructionist viewpoint; appreciation of the wider social-political environment; and the role of institutions and democratic frameworks

attributes. Fraser notes that the DHF helps to distinguish between morphostatic (superficial) and morphogenetic (good, real) change. Fraser essentially equates dialogic attributes to good, real change – in other words, if dialogic attributes are present then it is assumed that good, real change might have occurred.

As with Bebbington et al. (2007), Fraser situates his work in the school of deliberative democracy, although the DHF does recognise that multiple SAMs might be produced (attribute 3, content) if certain voices/opinions are lost in the construction of one SAM. Brown's work in comparison (2009) is based on the concept of agonistic democracy, which argues that rational consensus cannot exist if pluralism is to be taken seriously (pp. 320), and that continual conflict and antagonism are required. Brown's dialogic approach as a result requires the production of multiple SAMs by groups with different ideological orientations, rather than one SAM that incorporates the views of all participants. Brown argues that this approach allows: greater transparency; authentic expression; the demystification of power and dominant ideas (as the ideas of marginal groups are included, and an institutional viewpoint is clearly visible); and reflexivity and shifting of understandings.

Brown (2009) highlights Soderbaum's replacement of 'rational economic men' with 'political economic persons', and his advocation of positional analysis for sustainable development decision-making. Soderbaum's positional analysis is a pluralistic approach that involves the identification of the 'many sides' of a situation, reflection on multiple-stakeholder viewpoints, and the systematic treatment of monetary and non-monetary aspects (Soderbaum cautions against reducing all impacts to monetary amounts).

Table 2.1 – The Dialogic Heuristic Framework (drawn and amended from multiple Fraser tables, on pages: 99; 106; 231; 232; 250)

	Attribute	Dialogic	Organisational conditions for dialogic account	Non-Dialogic/ Monologic
Purpose & processes	**1. Purpose**	Medium of critical reflection (so that broader elements of sustainability can be raised and acted on); exploration of alternatives; raising of consciousness.	Organisation assists in creating spaces to enable transformation (possibly more than one) from within.	Convince, subdue, legitimate and manage (one group over another). EG – SAM vehicle for 'experts' to demonstrate to 'lay-people' that most efficient action taken in regard to project.
	2. Process	The process of constructing an account fosters critical questioning, problematisation, reconceptualisation (potentially of the project itself) and action.		Standardisation/ benchmarking, client-service provider transaction.
Content, participants and communication	**3. Content**	Heuristic learning – images, metrics, general language. Unpredictable content – decided on by people constructing the account, as a result of dialogue (which does not need to be consensual). SAM to include co-produced content and presented in multiple ways. More than one SAM constructed if voice of group/individual lost with construction of only one SAM. SAM might even be replaced; the framework is only a starting position.	Content provides medium for authentic voices with real-world problems to be voiced regardless of how previous accounts have been constructed.	Economically manageable aspects of business, formal and standardised language often monetary in value. Predictable content and presentation. SAM would be presented as part of formal business report, extension of a managerial toolkit. Would stick to best-practice methodology. Heavier emphasis on output rather than process.
	4. Knowledge Claims	Multi-perspectival and temporal – so always open to questioning and subject to re-exploration. Knowledge co-produced but contestable. A SAM is the product of the social and historical contexts at the time of its construction. A SAM produced under a set of influences during a period, is able to be explored with differing influences, both current and in the future.	There is no monopoly on truth claims as all have relevant realities to the participants. The account is not the reflection of one person at the expense of others, and the leadership structure would be open to conflicting reports prepared by staff.	Ahistoric, general portrayal of timeless truths and unquestionable facts. 'Correct' and 'right' answers provided. SAM might be used to conduct benchmarking exercising.
	5. Legitimate Voices	'Experts' and 'non-experts'. Inclusive and polyvocal. SAM to include a broad range of people. Traditional notions of expertise heard, but not at the expense of others (who may be considered to have traditionally unrecognised 'expertise'). People also have the right to not contribute.	'Experts' in an organisation would be recognised for the special skills they bring and would be responsible for highlighting the contestable nature of problems. This would include facilitation of dialogue (or at a minimum, the satisfaction of information rights, as some groups may not wish to dialogue) with groups outside the organisational boundary.	Privileging of experts, single discipline. Inclusion of 'correct' people would provide a strong basis from which to make rigorous knowledge claims.
	6. Communi-cation Sites	Any intersection between or within the organisation is a valid communication site (for SAM and associated discussions). No restrictions on who can communicate with whom in the construction and questioning of a dialogic SAM.	The organisation has a flexible boundary and facilitates communication occurring in multiple parts of the organisation and with people outside the organisation.	Single boundary between the organisation and community. Defined by formal internal structures. SAM would be constructed and communicated via formal communication channels, to the people requiring results; it would not be presented if it revealed 'inconvenient truths'.

Table 2.1 (continued)

	Attribute	Dialogic account	Organisational conditions for dialogic account	Non-dialogic/ monologic account
Time-scale, size and ownership	**7. Time-scale**	Flexibility in time-scale to reflect natural action cycles as appropriate. Therefore might look 50 or 100 years into the future and go beyond end of project.	Account considers time-frame so that 'real world' problems of account constructors can be raised and critically discussed. Organisational audit procedures would not have to conform to yearly cycles, but would follow continuous audit cycles within the conversations.	Whatever time-frame legally required or considered best-practice as determined by experts. Standardised annual or quarterly reports. Long-term time-frames often seen as more uncertain and therefore marginalised.
	8. Scale	Scale is flexible. May consist of highly aggregated or detailed information. SAM maybe produced on several different scales and not necessarily only consider the immediate project.	The organisation does not have to be the centre of the account. Instead the issue of relevance can take centre stage and second or third level impacts may still be considered even if they do not occur within the legal definition of the organisational entity.	Organisational entity and other formal structures, often highly aggregated to avoid 'commercial sensitivities' being divulged. Exclude effects outside entity.
	9. Ownership	No one person or entity can own an account. Owned by construction participants and anyone who has an interest in issues raised or not raised. The SAM a starting point for debate and shared with anyone for construction/deconstruction.	The organisation would freely share the SAM framework and would not move to collect royalties.	Intellectual property owned and reinforced via legislation if necessary. SAM might be owned by organisation that patented it. Users would have to pay royalties and deviations from the original best practice SAM would be viewed as a breach of copyright.

Building on Soderbaum's positional analysis, Brown (2009) sets out principles for a pluralistic critical dialogic approach (hereafter referred to as 'CDA') and applies these to the SAM (summarised in Table 2.2). Brown argues that the SAM *could* fit the bill as a pluralistic and participatory accounting technology; positional analysis, based on agonistic democracy, could make it more dialogic. She does however highlight certain limitations and barriers to a dialogic account. Firstly, there might be difficulties in gathering data, particularly for multiple accounts, and management are in a position to block the availability of data (perhaps using the excuse that it is not normally collected). Secondly, 'experts as facilitators' would be required (with the implication that if such experts are not available the attempt may founder). Thirdly, managers and the accounting profession may exhibit resistance (for example because they seek 'right answers', either due to a positivistic view or because the analysis proves uncomfortable), and Brown notes the "significant potential for managerialist capture in the absence of broader institutional change" (pp. 336). Fourthly, Brown cites Hagendijk & Egmond (2004), who argue that 'pseudo-participation' may occur – stakeholders voice their own positions without listening to others. (Brown does however argue that actors engaging in such a process are rarely unaffected by the views of others.) Finally, an agonistic approach risks paralysis, although Brown notes that agonism requires talking to stop at an appropriate point and action to begin.

This author has highlighted the significant linkages between the DHF and Brown's CDA by showing how each of Brown's critical dialogic principles links to specific DHF attributes (see right hand column of Table 2.2). Indeed, it can be concluded overall that the three frameworks presented generally contain the same underlying principles, with Fraser's DHF providing the most operational detail. Fraser's DHF will be the main analysis tool used by this thesis, but themes in the other frameworks (for example, power dynamics and barriers) will also be brought to the fore. The one key difference between the frameworks is Brown's use of agonistic democracy. The approach adopted later for a new application of FCA will ultimately be deliberative, but it will include agonistic motifs. The approach will do this by encouraging participants to build their own FCA models based on individual worldviews, before all views are accommodated in one model. This stance will be taken for pragmatic reasons given the scope of the research and the time available.

Bebbington et al. (2006) also champion the potentially dialogic, participatory nature of the SAM. Further, they argue that SAMs might overcome negative issues associated with cost-benefit analysis, and hence be a more favourable alternative to cost-benefit analysis when accounting for sustainability. Firstly, monetisation is defended as it allows debate in a language that managers understand, so economic rationalism can be fought on its own ground. Further, the SAM allows space for non-monetary 'bubble' items – it does not insist on monetisation in all cases. Identification and discussion of contentious impacts that cannot be monetised is therefore possible. Secondly, the subjectivity of figures produced is defended because this subjectivity is explicitly acknowledged by the SAM; it is made clear that figures do not represent 'objective truth', and the SAM does not claim to know the 'correct prices'. Thirdly, it is argued that distributional issues are better dealt with by the SAM than cost-benefit analysis, as the SAM 'signature' is more transparent than cost-benefit analysis outputs. Fourthly, it is argued that the reliance of the SAM on experts is diluted via the involvement of all stakeholders: "Decision-makers, stakeholders, and technical advisors are viewed as working together as co-investigators" (pp. 233). The SAM is pluralistic, and involves dialogue between parties with different interests and/or ideologies.

In summary, the discussion above highlights potential benefits of a dialogic approach and heuristic frameworks with which to evaluate how dialogic new applications are. It also finds only one example of a dialogic evaluation of a form of FCA. It can therefore be concluded that there is scope for new research engagements that seek to examine more dialogic FCA applications in empirical settings to further test the change potential of these applications. The last Section of this chapter will detail such a proposal.

Table 2.2 - Brown (2009) – framework for a critical dialogic approach, applied to the SAM (adapted from pp. 333)

Critical dialogic principle	Examples of application to the SAM
Recognise multiple ideological orientations	Engagement with a diverse range of stakeholders and ideological perspectives. Different SAMs constructed, consistent with particular ideological orientations (rather than looking for a "unified" SAM). **Link to DHF: 3, 4, 5.**
Avoid monetary reductionism	Utilise monetised SAMs to illustrate the limits of calculative technologies and question whether monetisation is appropriate for particular items. Expand the possibilities for non-financial indicators of performance and presentation of SAMs as part of a larger dialogic toolbox (e.g., supplementary visual material, narrative accounts). **Link to DHF: Possibly 3, 4.**
Be open about the subjective and contestable nature of calculations	Recognise the subjective and contestable nature of what is included, how items are included and the decision rules as to what constitutes a "sustainability" move. **Link to DHF: 3, 4, 5.**
Enable accessibility for non-experts	Recognise divergences of viewpoints within and between groups of experts. Role for "organic" experts who help social groups develop SAMs cognizant with their own values and assumptions and "border-crossers" who facilitate multi-perspectival dialogue and debate. Extended peer quality assurance processes – "non-experts" able to challenge expert analysis – experts learn from non-experts. Recognise the complex nature of relationships between knowledge, expertise and power (e.g. accountants are often oblivious to the values and assumptions underpinning their "technical" methods). **Link to DHF: 5.**
Ensure effective participatory processes	Pay particular attention to the context of application (e.g. whether settings enable people to speak "on their own terms" and engage in robust debate). Look for democratically supportive environments (e.g. ones that provide legal or contractual "rights" to information and participation). **Link to DHF: 1-5.**
Be attentive to power relations	Use SAMs to challenge power elites (e.g. to expose the frames dominating specific decision outcomes and their distributional impacts). Recognise a need for capacity building (e.g. developing skills and means to articulate currently marginalised voices in accounting terms). Retain the right "not to participate" in SAMs unless/until actors are able to participate in their own voice. **Link to DHF: All but particularly 5&6.**
Recognise the transformative potential of dialogic accounting	Use SAM as a tool for dialogic learning – discussion, debate, reflection. Look for conflicts and convergences across different sets of social actors as a basis for political action. **Link to DHF: all.**
Resist new forms of monologism	Resist temptation to use SAM to guide actors to pre-identified "new right answers". Use competing SAMs as a basis for ongoing monitoring (e.g. comparison of actual and expected outcomes) as a way of keeping discussions alive. Ensure ongoing contestability of SAM methodologies. **Link to DHF: 4.**

2.4.5 Laughlin's organisational change framework

Per Fraser (2010), Laughlin's organisational change framework (1991) is the most prominent framework used in the SEA field to examine change. It has been used by: Gray, Walters, Bebbington & Thomson (1995); Richardson, Cullen & Richardson (1996); Larrinaga-Gonzalez, Carrasco-Fenech, Caro-Gonzalez, Correa-Ruiz & Paez-Sandubete (2001); Larrinaga-Gonzalez & Bebbington (2001); Tilt (2006) and Bebbington (2007b). Fraser (2012) notes that three of the studies (Gray et al., 1995; Larrinaga-Gonzalez et al., 2001; and Tilt, 2006) use disclosures as a proxy for organisational change; only the original Laughlin study and Richardson et al find significant (morphogenetic) change. Laughlin created the framework by synthesising the organisational change literature. It is a middle-range theory; it uses both inductive and deductive theorising; and it is a 'skeletal' theory that is fleshed out by entering an organisational site (Fraser 2010, 2012).

Laughlin's framework is summarised by Bebbington (2007b), from which the following discussion is drawn (unless otherwise stated). Laughlin identifies three elements within an organisation - interpretive schemas, design archetypes and sub-systems. Sub-systems are the most tangible and interpretive schemas the least tangible. Per Bebbington, "the layers operate together to determine organisational activities and as such provide the basis from which we may understand organisations' actions." (p. 227). The elements are fleshed out in Table 2.3. Accounting is deemed to sit in the design archetype category, affecting decision processes and communication systems. It affects and is affected by interpretive schemas (Fraser (2010) also notes that accounting could affect the interpretive schema).

Laughlin maintains that the three elements exist in a state of equilibrium until they are disturbed, and that organisations are resistant to change (in other

Table 2.3: Laughlin's framework of organisational change (as summarised in Bebbington, 2007b)

Interpretive schemas
Beliefs, values and norms
Mission/purpose
Metarules
Design archetype:
Organisational structure
Decision processes
Communication systems
Sub-systems:
Tangible organisational elements

<u>Table 2.4</u> – Change categories in Laughlin's framework (adapted from Bebbington, 2007b, p. 228)

Generic description of change	Sub-category of change mechanism	Description
First order change or morphostatic change (things look different while remaining the same).	**a. Rebuttal**	Disturbance deflected so that the organisation can return to an inertial state. No permanent change observed. No change to interpretive schema.
	b. Reorientation	Disturbance results in change (because it cannot be rebutted) but changes are cosmetic and the 'heart' (the interpretive schema) of the organisation is not changed.
Second order change or morphogenetic change (the working model of the organisation changes fundamentally)	**c. Colonisation**	Disturbance is significant to the organisation and the interpretive schema, design archetype and sub-system (in some combination) change with a new organisational ethos emerging.
	d. Evolution	There is change to the underlying ethos of the organisation. Rather than this change arising directly from a disturbance, the organisation itself chooses to change.

words, the elements can engender inertia). Bebbington (2007b) notes that Laughlin does not specify disturbance types; she therefore suggests possible disturbances arising from the external environment, being changes in: laws or fiscal policies of government (deemed to be structural changes); commercial relationships within an industry/economy; expectations of financial stakeholders and capital markets; technology and/or ways of working within an industry/economy; relationships with stakeholders such as consumers, producers or employees; societal expectations about certain events/behaviours (p. 227). Bebbington also notes examples of internal disturbances – the appointment of a new CEO, or collective action of employees. Bebbington notes that while researchers have investigated these disturbances, how they affect organisations is still the subject of speculation; there is no single end result for a particular disturbance. However, Laughlin prescribes a number of end states – either first order (morphostatic) or second order (morphogenetic) change, with each state having two sub-categories. (Laughlin, drawing on Brunsson (1985), notes that the end state might depend on whether organisations have strong or weak ideologies – those at the weak end of the spectrum will be more open to manipulation and fundamental change.) Table 2.4 illustrates the four change categories.

Fraser (2010; 2012) draws on the notion of ‘assemblages’ to begin to ‘flesh out’ Laughlin’s framework. ‘Assemblages’, used by Larrinaga-Gonzalez & Bebbington (2001) and first defined by Duncan & Thomson (1998), are deemed to be “dynamic interconnected elements that bring about change at the organisational level” (Fraser, 2012, p. 510). Per Duncan & Thomson, an accounting technology may not bring about change if it is not aligned with an assemblage. Fraser therefore notes that there may be a number of interrelated disturbances; a researcher as a ‘change agent’ may be an important consideration in the mix.

Fraser (2012) discusses and provides examples of Laughlin’s four change categories. First order (morphostatic) change can lead to change of the design archetype but this rarely changes sub-systems or interpretive schema. There are two sub-categories of change. Rebuttal (labeled (a) in Table 2.4) does not alter the design archetype. An example would be where an organisation rejects an accounting technology to measure sustainability as they believe that sustainability is an issue that does not affect them. Reorientation (labeled (b) in Table 2.4) occurs when the design archetype changes, for example by ‘running’ the SAM. Sub-systems may also be altered as observable behaviours may have changed. However, behaviour is driven by the original interpretive schema. The accounting technology is ‘run’ as part of a legitimisation public relations process to draw attention away from an issue, and so is captured. Fraser notes that rebuttal or reorientation may still have an effect. Continual rebuttal illuminates attitudes towards sustainability and may be highlighted by outside groups (such as pressure groups). Alternatively, use of technologies for public relations purposes at least illustrates to organisations that they have a case to answer.

Second order change is deemed to be significant change and again has two sub-categories. Colonisation (labeled (c) in Table 2.4) occurs when change is precipitated by a ‘non-elected’ group in the organisation who are deemed to have ‘illegitimate’ power. Change usually starts in the design archetype, moves to the interpretive schema, and finally moves to sub-systems. An example would be where a SAM is used at the project level and this alters the perceptions of the participants; they then influence others in the organisation. Importantly, for later discussions in this thesis on institutional theory, it should be noted that Fraser (2010) states that an organisation should be regarded as being part of a wider social setting, with ‘institutional pressures’ possibly weakening a ‘recent colonisation’. Evolution (labeled (d) in Table 2.4) starts in a different area to a colonization. The interpretive schema alters first, as the people who hold power in the organisation seek change. For example, the Board wish to embed sustainability in the organisation and seek out technologies such as the SAM in order to achieve this.

Fraser (2012) concludes that any one organisation is unlikely to neatly fit under one of the four categories. Per Laughlin, there may be tensions/fractures; organizations are likely to retain a dominant regime with smaller pockets of tension, and this implies that morphogenetic change will not often occur (as noted above, the literature supports this notion). Fraser however offers an alternative explanation – either limited change occurs that is not judged fundamental by researchers, or fundamental change occurs but it is too subtle to be picked up by research timeframes and/or methods. He notes that Laughlin himself argues that rich empirical settings are required to put flesh on the middle-range theory and understand change; the use of assemblages as noted above may help. Fraser also notes that Larrinaga-Gonzalez & Bebbington's (2001) two-position heuristic provides a useful check when applying SEA technologies for organisational change; the institutional appropriation position acts as a critical check, as it is likely that both positions exist in every organisation.

As noted in Section 2.4.3 above, Fraser's work significantly builds on the study of the application of FCA at the organisational level by (a) examining the types of change precipitated (through use of Laughlin's framework) and (b) asking whether change is good or real change (by examining the dialogic nature of the applications, where 'dialogic' is a proxy for 'good' or 'real' change). However, Fraser does not link his findings to explanatory theories. The next section will attempt to do this.

2.4.6 Explanatory theories

The most common theories that have been applied to SEA (in particular to explain reporting behaviour) have been legitimacy and stakeholder theories. However, it will be argued below that another theory, institutional theory, might be more suitable for this thesis in order to help to explain why FCA might lead (or not lead) to organisational change.

Legitimacy theory, as discussed by Deegan (2007) (based on a number of his prior studies – see for example Deegan, 2002; Deegan & Unerman, 2006; and Deegan, 2006), states that legitimacy is a crucial resource that an organisation requires to continue to operate, which society bestows on it. A legitimacy gap (being the difference between societal beliefs and the perceived actions of an organisation) tends to precipitate action by the organisation. Per Bebbington (2007b), there are usually four different types of organisational response to legitimacy pressures. Firstly, the organisation changes its behaviour, and uses reporting to demonstrate this. Secondly, the organisation does not change its behaviour, but instead attempts to change perceptions using reporting. Thirdly, reporting is used to attempt to deflect attention from an issue. Finally, the organisation attempts to use reporting to change the expectations of its duties. Bebbington notes that the assumption of research based on legitimacy theory tends to be that organisations use SEA reporting to make sure that change does not occur. In other words, reporting is manipulative. Per Deegan (2007), environmental disclosures tend to be reactive, driven by events that have reduced legitimacy such as environmental accidents or prosecutions, or societal trends. Legitimisation can therefore be seen as a block against real change. Mathews (2004) highlights narrow organisational legitimacy, where organisations concentrate on producing focused disclosures to serve their own ends rather than opting for wide-ranging transparency.

Per Deegan (2007), legitimacy theory can be linked to stakeholder theory as disclosure can be used to gain or maintain support of particular groups of stakeholders.

Deegan (2007) also states that institutional theory picks up some of the motifs of legitimacy and stakeholder theories. Institutional theory argues that the way that organisations are structured – and the practices that they adopt – might gravitate towards commonality in order to conform with societal norms (or the norms of certain, powerful stakeholder groups) and to maintain legitimacy. If structures and practices differ from these norms, legitimacy may be lost and a legitimacy gap might arise. Larrinaga-Gonzalez (2007) explores institutional theory in more detail, examining sustainability reporting through a neo-institutional lense and using the notions of the organisational field and mechanisms of institutionalisation that expand on Deegan's explanation of conformity with societal norms.

Per Larrinaga-Gonzalez (2007), organisational fields are occupied by organisations who interact with each other and who share common values and norms, such as all organisations in a particular industry subject to the same regulation (DiMaggio & Powell, 1983; Scott, 1995). Fields may be based on issues important to the organisations in the field (Hoffman, 1999). Organisations in a particular field might hence be expected to adopt similar practices. Larrinaga-Gonzalez notes that in relation to sustainability reporting, fields tend to be local rather than global.

Larrinaga-Gonzalez (2007) notes that homogenisation of organisations ('isomorphism') occurs through three different mechanisms (DiMaggio & Powell, 1983); coercive, normative and mimetic. Similarly, Scott (1995) speaks of three pillars on which organisational legitimacy is based – regulative, normative and cognitive. Sustainability reporting might therefore be driven by these mechanisms/pillars of institutionalisation. The coercive mechanism or regulatory pillar posits that the law or market forces will force organisations to act in a particular way. For example, regulation, the threat of regulation, or pressure groups might force companies to engage in SEAR. The normative mechanism (or pillar) is based on social values and norms, which influence the behaviour of individuals; per DiMaggio & Powell, the values are based on professional networks and education. An example could be the Global Reporting Initiative ('GRI'), which has "codified the norms and rules of sustainability reporting" per Larrinaga-Gonzalez (2007, p. 159). Finally, Scott's cognitive pillar posits that cognitive structures exist, being symbols, meanings and roles that are taken for granted and which support organisational legitimacy. DiMaggio & Powell's mimetic mechanism could be seen to illustrate a cognitive dimension; organisations imitate successful and legitimate peer organisations. Larrinaga-Gonzalez (2007) recognises that interpretive schemes (Greenwood & Hinings, 1996) are the same as normative and cognitive structures, which gives a direct linkage to Laughlin's (1991) organisational change framework introduced earlier. Larrinaga-Gonzalez notes that the institutional theory literature argues that the pillars/mechanisms/structures lead to stability and inertia, with institutions being resistant to change. However, he draws on the work of Hoffman (1999) to examine how change can occur. Firstly, Hoffman notes that 'initiating events' (such as catastrophies or legal changes) may precipitate change as these create uncertainty and experimentation, and catastrophies are linked to subsequent environmental reporting in America. Secondly, Hoffman notes that organisational fields evolve, with new participants entering/influencing and the power of participants changing (for example, a professional body might enter the reporting field by setting up a sustainability reporting awards scheme, which influences subsequent institutional behaviour). Archel et al. (2011) also note that the structures of fields are influenced by social actors; some have more influence than others, with the level of influence depending on the amount of economic, cultural and social capital accumulated. Thirdly, he argues that Scott's pillars are connected and that change might progress through the pillars, from regulative to normative and cognitive. Finally, early adoption of change may be linked to competitive isomorphism, with later adoptors being influenced by institutional normative or cognitive drivers (such as imitation). Larrinaga-Gonzalez concludes that sustainability reporting might be a result of all three pillars/mechanisms, with a particular pillar having more weight in particular contexts. He also argues that institutional theory is richer than legitimacy theory. While legitimacy theory assumes only manipulatory behaviour (reporting to please the market) which could correspond with the coercive mechanism, institutional theory offers a number of motivations for behaviour based on the three mechanisms/pillars. Larrinaga-Gonzalez concludes that legitimacy theory is a particular case of institutional theory, and that institutional theory offers a longer-term view, by virtue of it studying the behaviour of organisations over time as institutionalisation occurs.

Institutional theory has been recently applied by Archel et al. (2011) (as noted earlier) to examine the homogenisation of CSR discourse and practice in Spain. Archel et al. finds that the development of government-led reporting initiatives, despite a widespread stakeholder consultation programme, ended up being heavily influenced and diluted by prior EU and business themes of voluntarism and business as usual, with dissenting views being influenced by and subsumed into a dominant business discourse that mirrored weak sustainability. The study therefore backs up the notion of institutional stability and inertia noted above that might prevent change from occurring. The study is worth exploring in some detail as it examines the dangers of engagement by certain non-conformist groups and the way in that seemingly heterogeneous discourse between groups becomes homogenised.

Archel et al. draw on the ideas of Pierre Bourdieu (1982, 1993, 2001) to add criticality to institutional theory. Bourdieu notes that dominant groups exist who seek to embed their dominant views and meanings into institutional structures and maintain these. Although discourse may be observed from both dominant and opposing (heretic or controversial) camps, those espousing heretic discourses will ultimately begin to adopt the language of the dominant and the heretic discourse will disappear. Archel et al. (2011) note that this process is one of coupling and de-coupling (Orton & Weick, 1990). Discursive de-coupling occurs when the dominant incorporate heretic viewpoints into their discourse and the heretics do likewise. This tends to occur due to familiarity, and the pragmatism of heretics. However, the dominant discourse eventually becomes the normal, taken-for-granted position, legitimised by the coupling/de-coupling process. While Archel et al. note that an organisational field tends to continually change due to outside pressures, institutional change is often second order, symbolic or small, which embeds dominant interests. The interests of some groups who could be seen to be heretic (for example, NGOs) get trapped within the institutional processes. Bourdieu (1993) also notes that organisations become caught in a ‘double-bind’, trying to convince different interest groups regarding the reconciliation of competing demands.

Archel et al.’s research study essentially seeks to determine whether those who challenge norms at organisational and institutional levels end up cementing the existing dominant position. They conclude that the dominant discourse does get institutionalised. Although polyvocal stakeholder engagement is observed, it does not ultimately challenge the dominant discourse. Archel et al. note that the “dice was loaded at the outset”; CSR agenda capture had already occurred prior to the stakeholder engagement process, with previous institutionalisation of a ‘business as usual’ discourse at European and national level. Stakeholder engagement was symbolic and legitimated the dominant position (discordant voices added to this legitimisation), and so was ultimately counter-productive.

The above studies have resonance for the development of FCA as a new accounting technology that could lead to emancipatory change. Institutional theory suggests that FCA might find it difficult to gain traction when faced with institutional inertia. Further even a supposedly dialogic form of FCA might be open to capture, with the heretic discourse of various stakeholder groups (which might be surfaced as impacts and different versions of a full cost account are debated) eventually being subsumed into a version that espouses a dominant, managerialist, business as usual position. The consideration of different viewpoints will however have legitimised this final position, a position that in reality has not been reached via dialogic means. The later Fraser applications appear to have suffered from this phenomenon. Examining existing and new FCA applications through an institutional theory lense may illuminate reasons for (non)change in an arena wider than that of an individual organisation, and so it is proposed that an analytical analysis be adopted that follows four steps. Firstly, evidence of initiating events that occur prior to the commencement of FCA applications should be gathered (these may be similar to Bebbington's (2007b) disturbances arising from the external environment or internally that precede organisational change). Secondly, it should be ascertained whether organisational fields conducive (or not conducive) to FCA exist. One might speculate that, consistent with the findings of Larrinaga-Gonzalez (2007) re sustainability reporting, a number of local fields might exist. As part of this exercise a political analysis should be undertaken that seeks to measure the influence of social actors in the field, according to their accumulation of economic, cultural and social capitals. Thirdly, it should be asked which of (or which combination of) the mechanisms/pillars of institutionalisation best explain the adoption or non-adoption of FCA (stability and inertia versus change) and its continued use (or discontinuation). Heretic and dominant discourses and discursive de-coupling should be examined. Finally, the existence of early (competitive?) adoptors should be examined.

2.4.7 A meta theoretical framework for analysis of FCA at an organisational level

The above sections have examined (a) Laughlin's organisational change framework; (b) dialogic forms of SEA/FCA, and frameworks with which to ascertain the dialogic nature of an engagement; and (c) an explanatory theoretical framework that could assist in further understanding the (non)adoption of FCA at the organisational level and/or the ability of FCA, once adopted, to lead to (non)change. This author proposes that the adoption of these three frameworks is appropriate for this thesis, to both analyse existing applications of FCA and the new application that will be proposed in Section 2.13. (Examining existing applications in Sections 2.5 - 2.12 will provide the rationale for a new approach.) Further, their adoption will be amalgamated with an Action Research research strategy, and in particular the Soft Systems Methodology ('SSM') variant of action research. Arguments for the use of these frameworks and this amalgamation are as follows.

Firstly, using the two theoretical frameworks applied by Fraser as a starting point plus adding the additional lense of institutional theory answers Thomson's (2007) criticisms of the field as noted in Section 2.4.2. Namely, it: ensures that the study will not be descriptive with no explicit use of a theoretical framework; shows engagement with prior studies; and allows 'persistent rigorous discourse' and 'rigorous problematisation and reflection of key thematic issues'. Fraser (2010; 2012) is the only current example to this author's knowledge of a dialogic evaluatory framework being employed at an empirical organisational SEA technology site. However, the enrichment of Fraser's DHF (drawing on important aspects of the analyses of Bebbington et al., 2007, and Brown, 2009), plus the inclusion of additional elements (use of institutional theory and an action research strategy) ensure that there is adequate deliberative difference and addition to knowledge.

Secondly, the addition of a critical form of institutional theory adds an explanatory dimension to Fraser's existing work that may illuminate reasons for (non)change in an arena wider than that of an individual organisation, as noted above.

Thirdly, by adopting an action research strategy (SSM variant), this study will seek to explicitly, consciously 'build in' to the research engagement a dialogic approach to the application (FCA model building and application), something that has been missing from previous studies. Such a strategy will also ensure that a researcher is embedded in the organisational process, something called for by Bebbington et al. (2007) (Section 2.4.4), Hopwood (1985) and Owen (2008) (Section 2.4.3). The study will also mesh SSM's situation 'finding out' analysis tools and root definitions with Laughlin's organisational change framework, the amended DHF and institutional theory, which will provide an immensely rich frame of analysis at a new case study site. The meshing together of the various frameworks is illustrated in Figure 2.3 overleaf. Action research as an appropriate research strategy will be justified and explored in much more detail in Chapter 3.

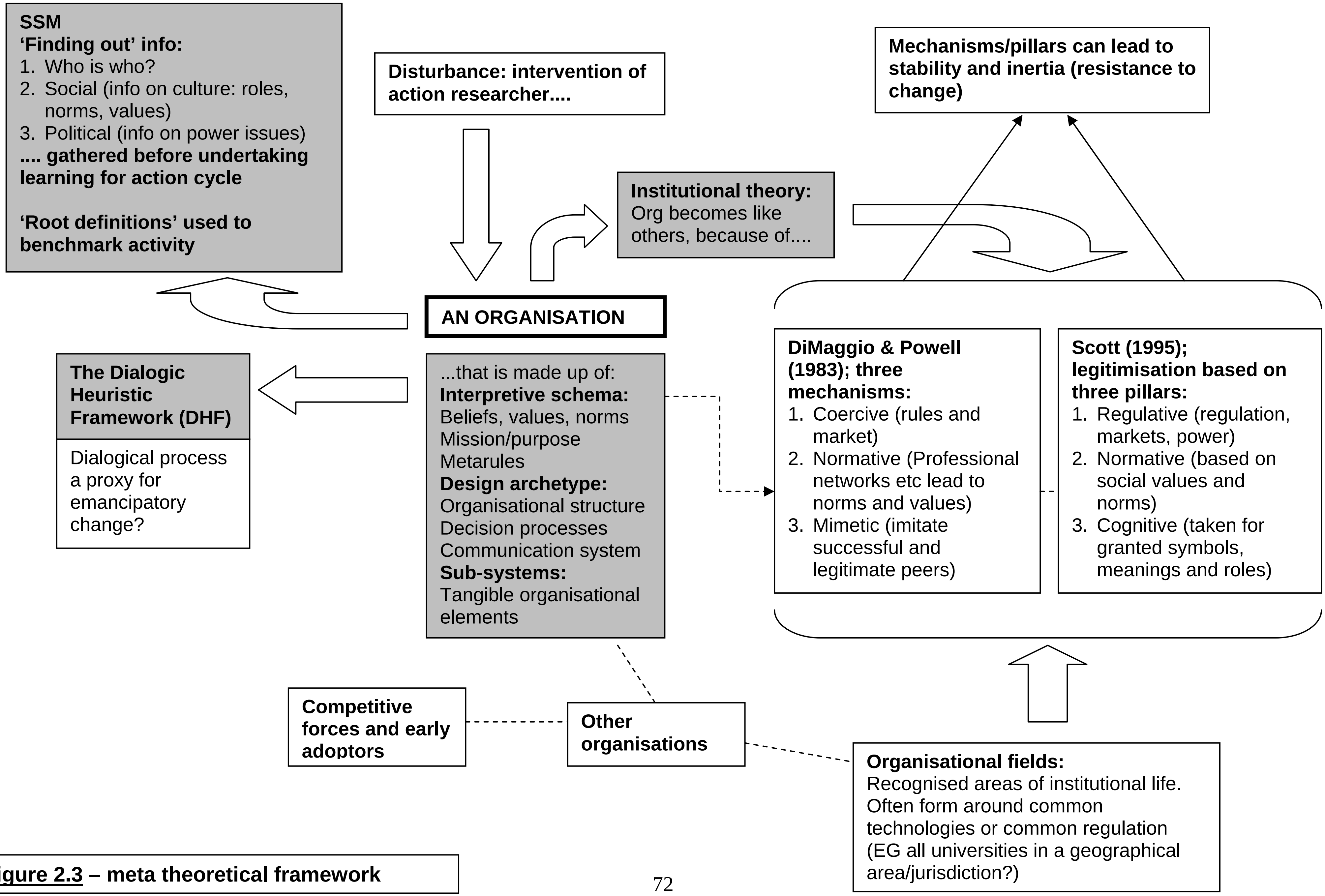


Figure 2.3 – meta theoretical framework

2.5 An introduction to FCA as a solution to corporate unsustainability

The literature tells us that prices and costs require correcting at both the macro and entity levels in order to internalise externalities and alter behaviour. In other words, externalities should be monetised in some way. Full Cost Accounting (‘FCA’), as defined by this author in Chapter 1, refers to accounting methodologies, approaches, techniques, tools or models developed to measure in common monetary terms the full economic, environmental and social impacts of an organisation’s activities including those outside of its usual reporting boundaries. It can therefore act as a corrector of incomplete accounting information. Some additional definitions of FCA sourced from the literature are as follows. Ontario Hydro (USEPA, 1996, p. 6) stated that: “FCA is a means by which environmental considerations can be integrated into business decisions. FCA incorporates environmental and other internal costs, with external impacts and costs/benefits of .... activities on the environment and on human health. In cases where the external impacts cannot be monetised, qualitative evaluations are used.” Further, Forum’s Sustainability Accounting (Bent and Richardson, 2003, p. 7) defined FCA as “…the generation, analysis and use of monetarised environmental and socially related information in order to improve corporate environmental, social and economic performance.” Forum sought to identify and monetise external social and environmental impacts (as well as identifying internal, hidden social and environmental costs and benefits), and their methodology incorporated natural, human and social capital (i.e., it recognised that externalities could degrade all such types of capital).

Note that these definitions relate to *entity*-level FCA. The question of who should instigate FCA and whether the scope of FCA should be wider than entity level has been explored in the literature. Bebbington et al. (2001) (p. 17-22) noted four approaches that could be used to internalise externalities. These were: the democratic/accountability approach (Approach 1); the full privatisation approach (Approach 2); the law, market instruments and structural change approach (Approach 3); and the shadow price approach (Approach 4). Approach 1 would involve developing social and environmental reporting, and making such reporting mandatory for all organisations. Eco-labelling of products could also help to achieve transparency. Bebbington et al. argued that the availability of such information would be the first step towards achieving sustainability; the demand for products might alter and prices might be partially corrected. Approach 2 would advocate the extension of the private ownership function to include all social and environmental aspects. This would introduce new costs and affect demand. (Examples in practice include the granting of mineral rights, emissions trading schemes, 'willingness to pay' calculations, and the purchasing of natural assets for safekeeping). Approach 3 would utilise governmental levers such as green taxation and regulatory/legal mechanisms (for example bans, control licences, subsidies and trading schemes), plus amendments to national accounts and macro sustainability gap analysis. Approach 4 would apply at the *entity level* (author's italics) and could take one of three forms: the rearrangement, re-definition and reporting of actual costs; the use of economic valuation systems to produce a social cost benefit statement (essentially a damage cost approach) and the use of existing market prices to calculate the cost that an organisation would have had to bear if it had acted in a sustainable manner during the accounting period ('the sustainable cost approach', essentially an avoidance cost approach).

Bebbington et al. noted that all four of their approaches together constituted FCA ("any system for getting the prices right must incorporate (at least some aspects of) all four approaches to internalising externalities. Any system designed to achieve FCA would be some meld of these four, non-discrete approaches" p. 22). Therefore, Bebbington et al. made a distinction between what could be termed 'macro' FCA (author's term) and 'entity level' FCA[35].

It could be argued that Approaches 1-3 have failed and will continue to fail to correct prices. The SEA literature has devoted much time to examining Approach 1 (accountability via social and environmental reporting, 'SER'), and so SER is critiqued in its own section below (Section 2.6). However, it can be concluded that SER has failed to bridge the information gap and correct prices. It is probably unrealistic to expect Approach 2 (the full privatization approach) to be adopted to

[35] This 'macro' FCA, particularly with its linkages to national accounts and macro sustainability gap analysis, could be seen as recognising the concerns re measuring sustainability at the organisational level discussed above.

such an extent that it would internalize all externalities (author's viewpoint). Indeed, Bebbington et al. (2001) were unclear as to whether the main exponent of the technique ever intended it to be a serious wholesale option. We have certainly not seen full-scale privatisation of all natural resources to date; however, certain aspects of the full privatisation approach have been adopted by policy makers and/or economists (such as emissions trading schemes and willingness to pay/willingness to accept calculations). Regarding Approach 3, Howes (2000) noted a lack of willingness by governments to adopt a sufficiently radical ecological tax reform programme and the fact that government legislation was often 'set low' due to multiple pressures. Howes concluded that governments had only partially intervened to regulate the market. Further, economic systems often failed to incorporate measures of environmental and social health within measures of economic success (see previous discussion in Section 2.3). The results of a recent global-level FCA application appear to prove that Approaches 1-3 have not fully internalised externalities to date. TRUCOST calculated that the largest 3,000 global listed companies produced negative impacts with a total monetary value of $2.15 trillion in 2008 (Mattison et al., 2011).

Howes and Bebbington et al. both concluded that in the absence of the full use of legal/regulatory/full privatisation mechanisms by governments to internalise all externalities, individual entities should seek to identify and monetise their remaining externalities – and should report their findings. This had also been advocated as far back as Gray (1992), and as recently as Antheaume (2007). This entity level exercise has generally been referred to as full cost accounting in the literature, with no reference to Bebbington et al.'s 'macro' level definition[36].

Atkinson (2000) noted that FCA at the entity level was not the only mechanism available to track corporate-level environmental impacts. He cited Elkington's triple-bottom line approach and the GRI guidelines that implement it (akin to Bebbington et al.'s Approach 1). The GRI advocates the production of economic, social and environmental key performance indicators. These are heterogeneous (ie they are not

[36] The early FCA literature tended to define FCA purely as an 'entity level calculation', probably because it has often dealt with specific FCA methodologies and experiments conducted at this level (see for example Howes 2000, 2002 & 2003b; USEPA, 1996; and Bent & Richardson, 2003).

all calibrated in the same unit of measurement), so only some are stated in monetary terms. Gray (2010) argued that the GRI was a work in progress at best and not a "complete narrative" (pp. 50) of social and environmental issues.

2.6 Social and environmental / sustainability reporting

The SEA literature has included a large range of studies that have examined the content, prevalence, quality and location of disclosure by organisations and suggested the reasons for and outcomes of such reporting (Gray & Laughlin, 2012; Owen, 2008).

Corporate reports have evolved since the 1980's from reporting on environmental issues to including economic and social issues and being labelled as so-called 'sustainability' reports (for example see Larrinaga-Gonzalez, 2007; and Gray, 2010). Further, the prevalence of (mainly voluntary) sustainability reporting has increased in recent years. Milne & Gray (2007) noted that over 2,000 multi-national corporations (MNCs) were undertaking sustainability reporting, but that 58,000 were not (and these figures excluded small and medium-sized enterprises ('SMEs')). They also feared that the number of entities reporting were reaching a plateau. However, the KPMG International Survey of Corporate Responsibility Reporting (2011) seemed to refute this fear as it noted that reporting had shown significant growth since the last survey (KPMG, 2008). The 2011 survey examined the performance of the top 250 companies listed on the Fortune Global 500 ('G250') for 2010 and the 100 largest companies by revenue ('N100') from 34 countries (KPMG 2011, p. 32). Archel et al. (2011) have also noted "the spectacular increase in the number of sustainability and CSR reports over recent years" (pp. 327).

Reporting has generally been of poor quality (for example, see Beck et al., 2010 for one recent sample or reporting in the UK and Germany, and Gray & Milne, 2002 & 2003). It has not provided a valid indicator of the sustainability or un-sustainability of organisations as environmental and social impacts rather than sustainability have been reported on; reports have ignored the systems concept of sustainability and the linkage of business to the degradation of the environment (Milne, 2007; Milne &

Gray, 2007)[37]. Reporting has shown evidence of the dominance of 'weak sustainability' thinking and behaviour within organisations (Tregidga & Milne, 2006; Milne et al., 2009). In a response note to a 2011 discussion paper from the Integrated Reporting Committee of South Africa, a group of global-wide 'sustainability professionals and scientists' (Houdet et al., 2011) also noted that "recent evidence suggests that sustainability reporting is falling far short of providing the detailed sustainability information needed by the institutional investment community for investment decision-making" (p. 2).

Milne & Gray (2007) noted that the quality of reporting had been lifted by adoption of the GRI guidelines, but that only a small number of organisations were reporting in accordance with GRI and obtaining assurance over the reports. The 2011 KPMG survey at least showed a positive movement in this area – 80% of the G250 and 69% of N100 companies were found to be 'adhering' to GRI guidelines (p. 20), and the percentage of companies obtaining assurance was 46% and 38% respectively (p. 28). The Prince of Wales Accounting for Sustainability project ('PoW A4S') has also suggested a reporting framework in recent years (see Accounting for Sustainability Group, 2007), and the current momentum appears to be towards integrated reporting (as alluded to above), a concept that integrates and presents as equal partners financial statements, sustainability reporting, governance and remuneration disclosures and the management commentary in a single report, and recognises the existence of six capitals[38] (IIRC, 2011). The process is being driven by the International Integrated Reporting Council, a body whose council include GRI, PoW A4S, World Business Council for Sustainable Development, accounting firm, accounting body, major corporate, UN, consultancy and NGO representatives (IIRC, 2012). According to KPMG (2011), half of the G250 were engaging in what they thought was integrated reporting, but that this tended to involve separate sustainability sections in the annual report rather than full integration. Recent adoption of the integrated reporting concept in individual countries (for example, in South Africa as a result of the King III Corporate Governance guidance; see for

[37] Milne & Gray noted that individual organisations were 'incapable' of reporting on systems level sustainability
[38] Being Forum's 5 capitals plus intellectual capital

example Sustainabilitysa, 2011) may have helped to spur on these international developments.

It has been argued in the literature that environmental and/or sustainability reporting has been used by companies to enhance their image (Owen, 2008; Beck et al., 2010), legitimize their behaviour and/or capture/neuter the debate on sustainability (Tregidga & Milne, 2006). Sustainability has been made to appear compatible with 'business as usual' and this is dangerous, as it leads to the misconception that organisations are practising sustainability so there is nothing to worry about (Tregidga & Milne, 2006; Milne & Gray, 2007; Owen, 2008; and Milne et al., 2009). Indeed, reputation and brand considerations were cited as the most important drivers of reporting in the 2011 KPMG survey.

After highlighting the weaknesses of social and environmental reporting, the narrative will now return to entity level FCA.

2.7 A summary of Bebbington's 'Approach 4' – entity level FCA

A number of common motifs have been found in FCA applications conducted to date. Bebbington et al. (2001) illustrated the key stages that a typical FCA calculation would go through (p. 68, adapted), being: the definition of the cost objective; the identification of internal costs and associated benefits (i.e., expenditure already internalised); and the identification and monetisation of external impacts. Dealing with external impacts would involve: specifying the scope or limits of the analysis; identifying, measuring and monetising the impacts; and linking monetised figures to the performance or position statements in the financial statements. Applications have tended to monetise impacts using one of two very different costing methodologies - the damage cost approach or the avoidance/restoration cost approach. Table 2.5 below summarises the main environmental valuation methods. These are also critiqued in Section 2.9.

Table 2.5: Environmental valuation methods

According to Bent & Richardson (2003), there are two main methods for valuing environmental impacts – demand side methods and supply side methods.

Demand side methods

These methods estimate demand for environmental resources based on stakeholder preferences, and are based on 'willingness to pay' (WTP) or 'willingness to accept' (WTA). WTP represents the amount people are willing to pay for environmental benefits (such as an improvement in air quality); WTA represents the amount of compensation people are willing to accept to suffer environmental loss (such as a reduction in air quality). *Essentially these methods are estimating the cost of environmental damage and are referred to in the literature as the 'damage cost' or 'cost of damages' method.*

Examples of demand side methods:

1. **Hedonic pricing.** Information from a surrogate market is used to estimate the value of an environmental 'good' or 'service' (example: the premium on house prices in an area unaffected by pollution).
2. **Travel cost method.** A combination of information from surrogate markets and surveys is used to estimate the demand for environmental resources (example: valuation of environmental sites based on the cost of getting to them).
3. **Contingent valuation method.** The environmental preferences of individuals are determined using surveys, questionnaires and experimental techniques. The technique determines hypothetical, not actual observed behaviour. It has a wide application but is the most unreliable of the three methods due to a number of inherent biases.

Supply side methods

These methods estimate the cost of supplying environmental resources or services. They capture the cost to organisations of improving environmental quality – not the benefits to society.

Examples of supply side methods:

1. **Avoidance cost method.**
2. **Replacement/restoration cost method.**
3. **Productivity approach.** This method measures the impact on productivity of changes in environmental quality. The idea is that changes in environmental quality will lead to changes in output and prices that can be observed. For example, if soil erosion is improved, this will affect changes in agricultural yields and prices. Therefore, the costs of soil erosion can be evaluated by looking at agricultural markets.

Source: adapted from Bent and Richardson (2003), p. 49-50.

Antheaume (2004) also noted – and used - the collective consent to pay ('CCP') method, which can also be described as a demand side method. Per Antheaume, under this method it is assumed that environmental expenditure incurred by households and local/national governments represents a collective consent to pay for prevention/restoration of some effects of all pollution. (An example would be water purification costs.) It is also assumed that a linear relationship exists between a country's emissions and the environmental expenditure incurred. CCP is then calculated by: aggregating environmental expenditure; weighting overall emissions (as some are more harmful than others); weighting company/process emissions; and calculating the company/process share of overall costs.

2.8 An overview of FCA applications undertaken to date

2.8.1 Introduction

A number of FCA methodologies have been developed and applied by academics, non-governmental organisations and corporations, with the most sustained period of activity occurring since 1990. However, the overall number of applications in the public domain remains small, and early applications in particular tended to be ad-hoc, experimental and incomplete in nature with little consistency in application[39]. The Sustainability Assessment Model ('SAM') – with a relatively long history of development and application – has started to buck this trend. Milne (2007) states that the field "remains rather thin" (p. 51) and Frame & Cavanagh (2008) argue that the SAM is a model in its metaphorical teenage years that requires further development. There have been a number of calls in the literature to persevere with FCA and to undertake new applications of FCA to 'iron out' problems inherent in its implementation (for example, see Antheaume, 2004 & 2007; Milne & Gray, 2007; Unerman et al., 2007b; and Frame & Cavanagh, 2008 in addition to Brown & Frame, 2005 and Bebbington et al., 2006). See Figure 2.4 for an author summary of the key FCA methodologies, applications and associated literature to date. Applications are categorised according to the date that they appeared in the literature, and are then grouped in columnar streams that reflect their major technical characteristics. The first two streams contain applications that have produced cost outputs. Applications in Stream 1 have utilised an amalgam of avoidance and restoration costs (being the cost of avoiding a particular impact, or the cost of restoring the damage caused by the impact; avoidance costs have tended to be used in preference where available). Applications in Stream 2 have utilised damage costs (being costs that reflect the actual damage caused by specific impacts). Stream 3 contains applications that have focused on the balance sheet, plus other miscellaneous approaches (namely Figge & Hahn's Sustainable Value). The explicit purpose of some of the Stream 3 applications has been to value natural capital and/or biodiversity impacts. Further, a

[39] Gray (2010) noted a tendency for 'sustainability accountings' to be halted by participating organisations when they did not give them the answer (that the organisation was acting in a sustainable manner) that they were hoping for. There have also been many practical difficulties with FCA, as highlighted below.

minority of applications in Streams 1 and 2 have also included some natural capital/biodiversity impacts as part of a wider range of impacts.

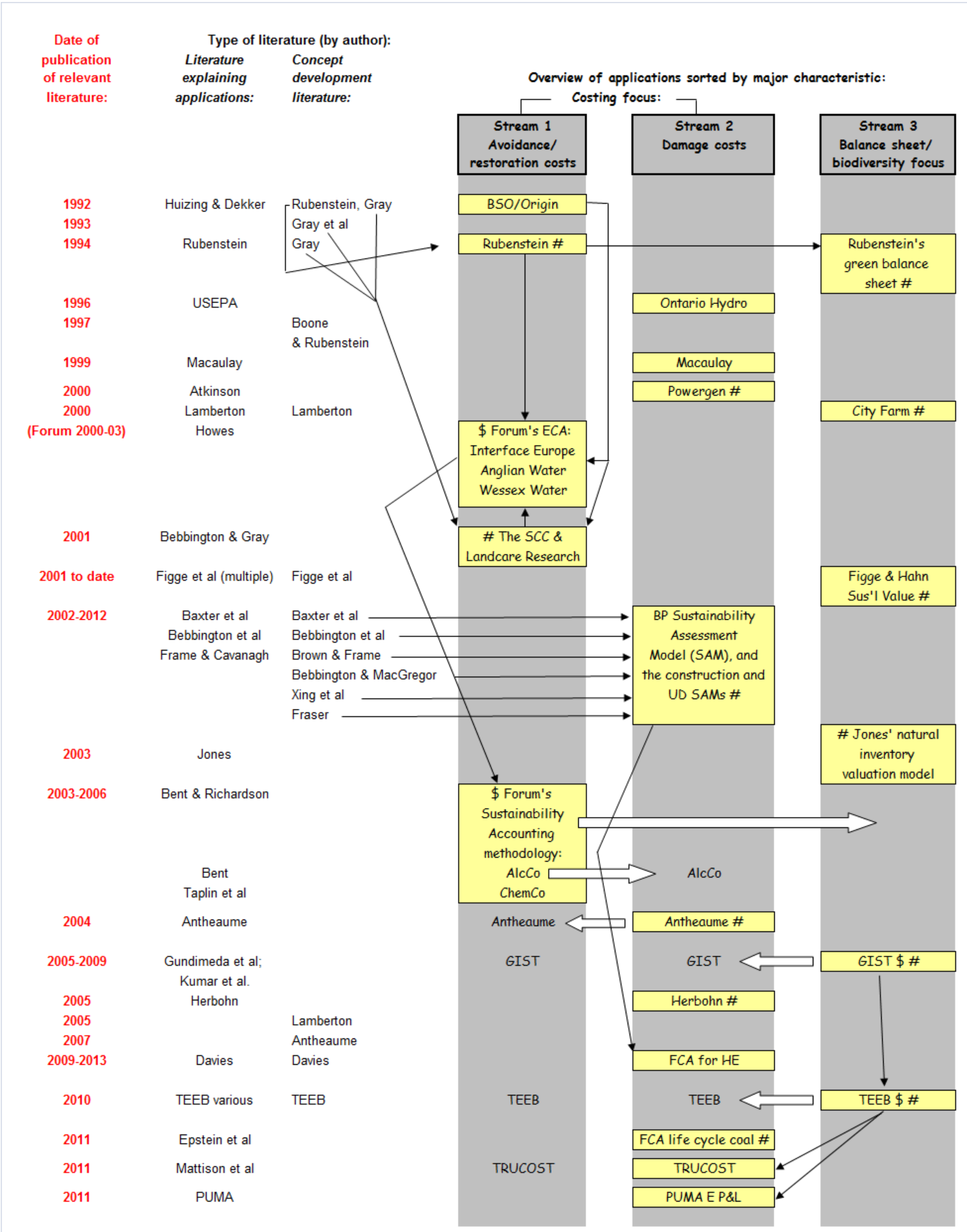
Applications that have demonstrated multiple characteristics appear in more than one stream, connected by thick arrows. (For example, the AlcCo application utilised both avoidance/restoration and damage costings.) Thin arrows demonstrate how concept development literature has influenced subsequent applications (or how early applications have influenced later applications). Overall reviews of the field have been provided in the literature by Bebbington et al. (2001), Lamberton (2005), Xing et al. (2006), Bebbington (2007a), Antheaume (2007) and Fraser (2010).

The types of organisation that have undertaken FCA applications have been wide and varied. For example, in Stream 1 organisations included: a Dutch software company (BSO/Origin); a (fictional) forestry company (Blackmore & Price, in the Rubenstein application); a research company examining land eco-systems (Landcare Research); a flooring manufacturer (Interface Europe); two water utility companies (Wessex Water and Anglian Water); an alcohol producer (AlcCo); and a division of a chemicals company (ChemCo). Stream 2 saw multiple applications in the electricity generation industry (namely Ontario Hydro, Powergen and LCA coal, and wide and varied applications of the SAM (for examples see: Baxter et al., 2004; Bebbington & MacGregor, 2005; Bebbington, 2007a; and Xing et al., 2008).

It could be said that if FCA is an attempt to internalise external costs, and if this is undertaken to change behaviour and encourage sustainable development, then it should follow that all external economic, environmental and social costs and benefits are captured in a FCA exercise. The FCA applications highlighted above often failed to capture all such costs and benefits. Very often, therefore, FCA in practice has actually been *fuller* entity cost accounting (when compared with traditional financial accounting) but not *complete* entity full cost accounting (author’s italics).

Figure 2.4 - summary of the development of FCA (by literature)

Key
- denotes involvement of academics
$ - denotes involvement of non-governmental organisations (NGO's)



2.8.2 Key technical characteristics of applications

Tables 2.6 – 2.8 below summarise each application according to its key technical characteristics, namely the: type of organisation and activities included; internal costs and benefits identified; boundary set and external impacts identified; methods of monetisation; impacts monetised; and linkage to performance and position statements. This has been undertaken to provide information to drive the critical analyses in Sections 2.9 onwards.

Table 2.6: Summary of FCA applications since 1990 – Stream 1 (avoidance/restoration costs)

Date and name of application		Type of organisation and activities included	Internal costs and benefits identified? (Ec/S/En)[40]	Boundary set & external impacts identified (Ec/S/En)	Method(s) of monetisation	Impacts monetised	Linkage to P&L a/c and balance sheet (BS); reporting
1	**BSO/Origin (1990 - 1995).** Reported in Huizing & Dekker (1992) and Bebbington et al. (2001).	Dutch software company. Impact of activities of whole company included.	Existing En expenditure[41]; also Ec benefits in form of 'company value added' (restatement of accounting profit)[42].	Narrow - limited to direct En emissions of BSO itself, En emissions from power stations that supplied power (excl. nuclear) and pollution from water treatment and incineration plants that dealt with BSO's waste. Data gathered from approx 60 locations using questionnaires; accuracy and exactness of data streams questioned. Only upstream and downstream effects 'one step back' captured, although extended in 1995 and completeness of impact identification improved.	<u>1990-1994</u>: Calculation of 'value withdrawn': sustainability gap identified (current emissions vs societal optimal emissions) and avoidance costs calculated (damage costs used where not available). <u>1995</u>: Sustainability gap based on zero environmental risk. Restoration costs used where possible.	It appears that all impacts identified were monetised. Example – net value withdrawn in 1994 = 3.8m Dutch guilders. 1995 net operating income *negative*.	Solely P&L focus. Shadow costs deducted from accounting profit figure. Disclosed in annual reports between 1990-1995. <u>1990-1994</u>: Net added value calculated (company value added less net value withdrawn[43]). <u>1995</u>: Sustainable net operating income calculated (presumed that net value withdrawn deducted from operating income).
2	**Rubenstein (1994).**	Impact of major activities of fictional forestry company – tree planting and processing of timber in lumber and pulp mills.	Not calculated.	Existing En "business as usual" position examined as a starting point for development of more sustainable positions (2 modelled). Boundaries unclear.	Value of commercial forest capital based on present value of stumpage fees for 60 years. Non-commercial value of natural capital based on principal/interest relationship (rate of return from timber known to be 18%). Avoidance/restoration costs used when examining cost of more sustainable positions for operations – costs of getting to more sustainable positions. Tentative benefits identified (for example, price premiums). Risk costs also identified (future liabilities based on various current positions).	Numbers calculated used for illustrative purposes only – rough estimates/very soft numbers for costing of more sustainable alternatives. Non-commercial value of natural capital = $530m.	P&L: Incremental costs of more sustainable operations. B/S: Value of commercial and natural forest capital calculated, plus estimates of future liabilities.

40 **<u>KEY</u>: En = Environmental; Ec = Economic; S = Social**
41 Fuel levies, water treatment and refuse collection charges
42 Sum of personnel costs, depreciation, provisions, financial expenses, taxation and net profit/loss
43 Net value withdrawn = value withdrawn less internal company environmental expenditure

Table 2.6: Summary of FCA applications since 1990 – Stream 1 (avoidance/restoration costs - continued)

Date and name of application		Type of organisa-tion and activities included	Internal costs and benefits identified? (Ec/S/En)	Boundary set & external impacts identified (Ec/S/En)	Method(s) of monetisation	Impacts monetised	Linkage to P&L a/c and balance sheet (BS); reporting
3	**Landcare Research (1996 onwards).** Reported in Bebbington & Gray (2001) and Bebbington et al. (2001).	Research company examining land eco-systems. Specific activities and impacts: energy, transport, fieldwork of the company, and a significant capital project[44].	Exercise not undertaken.	Narrow due to data gathering problems. Direct En emissions from generation of electricity from fossil fuels and vehicle and air travel, rather than emissions from full life-cycle analyses. Wide in one respect - carbon emissions from manufacture and transport of some building materials included. Large number of impacts excluded.	Intended - avoidance costs and then restoration costs (to leave planet no worse off after activity), assuming that the business would continue as usual. Problems in identifying sustainable alternative practices and in obtaining remediation costs (or choosing between alternative remediation costs). Alternative calculations looked at economic cost of more sustainable (and slower) transport options.	Low level of monetisation of impacts. Impacts monetised (1997 quoted as an example): Carbon remediation costs (NZ$1k-$47k). Shadow price for NOx (NZ$53k; appears to have been based on a damage cost). Incremental transport costs, more sustainable option (NZ$906k).	No linkage to P&L a/c or B/S.
4	**FORUM: Interface Europe (2000 – unclear).** Reported in Howes (2000 & 2002).	Flooring manufacturer. Activities of whole company.	*Unclear from literature.*	Narrow system boundaries applied under Forum's ECA. Only direct (first level) En impacts included under ECA[45], plus second level impacts from use of electricity identified. (Impacts limited to air for Interface. Emissions to water not material, waste impacts captured via internal expenditure.) Wider impacts could be identified per ECA but included 'below the line'; Interface Europe (only) did this for raw material suppliers in later calculations.	A development of Gray's SCC (used in Landcare Research). Identification of a sustainable level of emissions (the 'sustainability target') and the calculation of a 'sustainability gap' (the reduction in emissions required to reach the target figures). The most up-to-date scientific knowledge was utilised to estimate a sustainable level of emissions. Howes (2002) recognised that knowledge was not complete and that targets represented best current estimates. Impacts valued by calculating cost of reducing impacts to target levels. Avoidance or restoration costs were used to obtain a 'sustainable cost' estimate. Difficulties obtaining avoidance/restoration costs for non-carbon transport emissions (due to lack of appropriate technologies). Therefore damage costs appear to have been used for SO_2.	Sustainability cost £1.25m (1997)	Sustainable cost deducted from financial accounting profit. No B/S link (no provision for sustainability cost).

[44] Specific activities cherry-picked rather than all company-wide impacts identified. Selected based on anticipated size of impacts, ease of quantification and ability to be used to test SCC.

[45] Impacts that a company is directly responsible for and is most able to control.

Table 2.6: Summary of FCA applications since 1990 – Stream 1 (avoidance/restoration costs - continued)

Date and name of application		Type of organisa-tion and activities included	Internal costs and benefits identified? (Ec/S/En)	Boundary set & external impacts identified (Ec/S/En)	Method(s) of monetisation	Impacts monetised	Linkage to P&L a/c and balance sheet (BS); reporting
5	**FORUM: Wessex Water (2000 – 2007[46]).** Reported in Howes (2002 & 2003).	Water utility. Activities of whole company.	Produced environmental financial statements relating to single projects or assets.	As for Interface Europe above.	As for interface Europe above.	In 2001 sustainability cost calculated at £8.3m (11.5% of post-tax profits).	As for Interface Europe above.
6	**FORUM: Anglian Water (now AWG) (2000 – unclear).** Reported as for Wessex Water.	Water utility. Activities of whole company.	*Unclear from literature.*	As for Interface Europe above.	As for Interface Europe above.	Sustainability cost estimate increased from £15.55m (8.1% of post-tax profits) in 1999 to £16.4m (11.9% of post-tax profits) in 2001. The increase was driven by an increase in consumption of fossil fuel derived electricity to meet higher water quality standards.	As for Interface Europe above.
7	**FORUM: AlcCo.** [subject of Bent 2004]	Alcohol producer. Activities of whole company.	Internal S and En costs excluded (except for alcohol excise duty paid). Ec impacts = accounting profit.	As for Interface Europe etc above but wider boundary set - impacts arising from growth of raw materials included. S costs of alcohol on society (after detailed stakeholder consultation) also included.	Avoidance/restoration (shadow) costs AND damage costs. Shadow costs assoc with raw materials based on external costs of agriculture (so based on damage costs? Literature unclear).	Unclear whether all impacts costed. Costs identified in 2003: Environmental: Shadow costs £1.7m External costs £4.5m Social: Shadow costs £0.7m External costs £57m	Costs deducted from accounting profit but no linkage to B/S. Accounting profit before deductions £7.4m.
8	**FORUM: ChemCo. [subject of Taplin, Bent & Aeron-Thomas 2006]**	Division of chemicals company. Various activities examined depending on stage; mainly looked at five products.	Ec benefits (via production of EVA statement), S and En costs (benefits not highlighted due to difficulties gathering data).	Identification of Ec, S and En impacts arising from five products. Unclear how wide boundaries were set during the exercise; however, life cycle analysis, stakeholder feedback and interviews across the organisation used to determine impacts so it appears that boundaries were set wider than earlier Forum experiments.	Avoidance/restoration (shadow) costs calculated for impacts identified from five products.	Avoidance/restoration (shadow) costs, value of £3.9m. Unclear whether all impacts costed. Product impacts stage looked at one product – refridgeration lubricant. CO2 savings from product compared to CO2 emissions highlighted in previous stage.	No explicit linkages to P&L and B/S.

46 Discontinued by 2011 (reasons not published). Last noted in 2007; year of discontinuation could not be ascertained per Wessex Water website.

Table 2.7: Summary of FCA applications since 1990 – Stream 2 (damage costs)

Date and name of application		Type of organisation and activities included	Internal costs and benefits identified? (Ec/S/En)[47]	Boundary set & external impacts identified (Ec/S/En)	Method(s) of monetisation	Impacts monetised	Linkage to P&L a/c and balance sheet (BS); reporting
1	**Ontario Hydro (to 1995).** Reported in USEPA (1996).	Canadian electricity generator. Impact of fossil fuel and nuclear power stations.	Existing En expenditure identified.	Impacts on En and human health (S) arising from *operation* of fossil fuel stations and full life-cycle of nuclear stations (fuel extraction to decommissioning). Did not include life cycle impacts of transmission and distribution systems, hydroelectric stations, renewable energy technologies and demand management.	Damage function approach used with site specific data. Market prices used to estimate monetary values for impacts (eg crop losses) traded in the market. For impacts not explicitly traded in markets (eg human health and mortality), valuation techniques used to derive estimates of willingness to pay (WTP) or willingness to accept (WTA) for changes in environmental quality.	Implied that not all impacts monetised as noted that some impacts would be considered in qualitative terms in Multi Criteria Assessment; also further research planned on impact and cost data. Prelim. Estimates published: For 1992, impacts of fossil fuel generation = C$95.8m. Nuclear costs published per KWh.	Monetised external impacts fed into investment decision-making process. No attempt to deduct external costs from profit or to provide for them.
2	**'Corporate Reporting for Sustainable Agriculture' (Macaulay (1999)).** Cited in Bebbington et al. (2001) – original report not available.	Impact on environment of five farms.	No.	Boundary set appeared narrow. Four environmental impacts identified: effects on water quality; GHG emissions from fossil fuel use on the farms; maintenance of biodiversity and management of cultural landscapes.	Marginal social damage of GHG emissions.	Only GHG emissions.	N/a
3	**Powergen.** [subject of Atkinson 2000]	Electricity generation activities of UK power generator.	None identified.	Boundaries narrowly set as upstream and downstream impacts not identified. Major En airborne pollutants arising from electricity generation included.	Unit marginal damage cost per tonne for each En pollutant. Ranges of costs noted from various studies; costs at the lower boundary applied.	Appears that all impacts identified monetised. Between 1992-95 found that CGS rate was negative; became positive in 1996.	Damage costs charged against net profit before tax to give 'corporate genuine saving' (CGS) rate. No B/S link.

[47] **<u>KEY</u>: En = Environmental; Ec = Economic; S = Social**

Table 2.7: Summary of FCA applications since 1990 – Stream 2 (damage costs - continued)

	Date and name of application	Type of organisatio n and activities included	Internal costs and benefits identified? (Ec/S/En)	Boundary set & external impacts identified (Ec/S/En)	Method(s) of monetisation	Impacts monetised	Linkage to P&L a/c and balance sheet (BS); reporting
4	**Sustainability Assessment Model (SAM) in BP** [subject of Baxter, Bebbington & Cutteridge 2002]	Oil company. Assessment of single project (a typical oil and gas field development).	Ec, S and En costs and benefits (but operating and capital expenditure does not appear to have been split to highlight En and S abatement expenditure).	Ec, resource, S and En impacts over full life cycle. Scope/boundaries defined widely – all stages of oil and gas project (from exploratory drilling to decommissioning of platform) plus refining, and manufacturing and use of oil and gas based products (hence cradle to grave). Upper limit of 25 impacts used – 22 identified for BP. Based on significance and availability of data.	Damage cost estimates primarily used.	Impacts identified monetised.	Figures calculated not explicitly linked to P&L a/c or B/S. Two outputs produced: SAM signature (graph of positive and negative outputs) and SAM indicator (% measurement of sustainability).
5	**Other SAM applications.**	The SAM has been applied to a number of projects in the oil and gas industry post the initial BP application, and it has been used to assess concept decisions for an off-shore hydrocarbon development and the performance of the UK oil and gas industry as a whole. It has also been applied to projects in other fields (for example, it has been used to evaluate energy extraction from landfill, a tree planting scheme, a salmon farm, City Council projects and a social housing project in New Zealand) (Baxter et al., 2004; Bebbington, 2007a; Fraser 2010 & 2012). It has also been developed into a construction SAM (see Bebbington & MacGregor, 2005) and taken forward in an urban development form by the SUE-MoT project (for example, see Xing et al., 2008).					
6	**FCA applied to a single industrial process.** [subject of Antheaume 2004]	Refinement of raw natural gas at one industrial facility.	None identified.	Appears boundary set reasonably widely; direct and indirect inputs and outputs identified. (EG impact of: raw materials and energy used in process; facility construction; emissions from process; and emissions from manufacture of inputs.) Life cycle inventory and life cycle analysis conducted. However, no attempt to calculate impact of storing, transporting or using natural gas product or impacts associated with exploration for/extraction of raw natural gas.	Three methods used: avoidance cost method; cost of damages method; collective consent to pay method. Under the avoidance cost method, costs for each flow were taken from publicly available studies. The highest, lowest and median costs were taken where available, as it was difficult to assess how individual costs related to the gas refinement process. Under the cost of damages method, categories of damage were quantified using low, median and high assumptions from the EC's ExternE project. Under the collective consent to pay method, different sets of regulatory standards to weight emissions were used to produce three results: low, median and high.	Out of 300 flows of materials and energy generated directly and indirectly by process studied, only 25 were translated into monetary terms (by the most complete method of evaluating external cost) – this was less than 10% (a poor conversion rate). Significantly different cost ranges were also produced (because the three costing methods were applied to each flow where applicable, and highest, lowest and median costs were applied for each flow and method).	Costs calculated not linked to P&L a/c or B/S.

Table 2.7: Summary of FCA applications since 1990 – Stream 2 (damage costs - continued)

Date and name of application		Type of organisation and activities included	Internal costs and benefits identified (Ec/S/En)	Boundary set & external impacts identified (Ec/S/En)	Method(s) of monetisation	Impacts monetised	Linkage to P&L a/c and balance sheet (BS)
7	**Herbohn (2005).**	Australian government department managing public forests.	Not attempted.	Intention to capture positive and negative En impacts of department.	Intention to use damage costs and the choice modelling and benefits transfer valuation methods.	No impacts monetised, due to funding cuts, political scrutiny and resistance from departmental managers.	Anticipated that damage cost estimates would be deducted from profit.
8	**FCA for life-cycle analysis of coal.** Epstein et al. (2011).	Annual impact on USA of generating electricity from coal.	Not undertaken.	Full life cycle of coal used for electricity (extraction, transport, processing, combustion) and identification of waste streams. Study based on data for Appalachia, and extrapolated to cover all coal electricity generation across USA. Mainly En, but some social and E impacts identified.	Damage cost estimates primarily used: Climate impacts – social cost of carbon ($30); Public health impacts (mortality) – value of statistical life.	Impacts monetised ($345.3bn best estimate; low and high values also calculated): Damages due to climate change; public health damages from NOx, SO2, PM and mercury emissions; coal transport rail accident fatalities; coal mining public health costs; government subsidies; lost value of abandoned mine lands. Impacts not monetised: Impacts of toxic chemicals and heavy metals on ecosystems; some ill-health air pollution impacts; direct risks of wastes (EG coal combustion waste); impact of nitrogen deposition to water; acid rain and mine drainage; long-term impacts of living near coal sites; ozone health impacts; and full assessment of impacts of unstable climate.	Not applicable.

Table 2.7: Summary of FCA applications since 1990 – Stream 2 (damage costs - continued)

Date and name of application		Type of organisation and activities included	Internal costs and benefits identified (Ec/S/En)	Boundary set & external impacts identified (Ec/S/En)	Method(s) of monetisation	Impacts monetised	Linkage to P&L a/c and balance sheet (BS)
9	**TRUCOST.** Mattison et al. (2011).	Not limited to any one organisation.	Not undertaken.	Global external environmental impacts identified for 2008. Also projected forward to obtain annual figure in 2050. Subsets of total identified: - Impacts of largest global 3,000 listed companies by market capitalisation - Impacts of a typical large diversified equity fund	External costs of marginal changes in resource use, pollution and waste. Various methods used: Revealed preference approaches (market prices); Cost-based approaches (costs to replace ecosystem goods and services, expenditure on mitigation or averting damage, damage costs avoided by preventing climate change or maintaining ecosystems); Stated preference approaches (surveys to measure people's willingness to pay to maintain ecosystem services not traded). CO_2 valued at $85/tonne for 2008 (taken from Stern review), increased over time.	Impacts monetised: - Greenhouse gas emissions; - Emissions of SOx, NOx and PM; - Natural resource usage (limited to water, timber and fish, and limited within these categories); - VOCs; - General waste; - Mercury. Total global costs for 2008 estimated at $6.6trillion; costs attributable to largest 3,000 listed companies estimated at $2.15trillion. Total global costs for 2050 estimated to rise to $28.6trillion.	Not applicable as not related to one entity.

Table 2.7: Summary of FCA applications since 1990 – Stream 2 (damage costs - continued)

Date and name of application		Type of organisation and activities included	Internal costs and benefits identified (Ec/S/En)	Boundary set & external impacts identified (Ec/S/En)	Method(s) of monetisation	Impacts monetised	Linkage to P&L a/c and balance sheet (BS)
10	**PUMA (2011a-i).**	Sports footwear and clothing manufacturer. All activities of company included. Based on activities during 2010.	Not undertaken.	Boundaries set wide - impacts of core business operations plus supply chain in 4 categories (Tiers 1-4). En impacts from greenhouse gas (GHG) emissions, water use, land use, air pollution and waste (landfill and incineration) identified. Stated that next stage of project will look at S impacts; finally, beneficiaries of Ec impacts to be identified.	Methodologies supplied by TRUCOST and PWC. *Valuation of GHG emissions:* Derived from subset of SCC values collated in Tol (2009). Low social discount rate used based on economic growth and adjustment made to convert older estimates to 2010. Value of $87 used. *Water use valuation:* Cost of reduction in services due to water extraction, based on literature review values adjusted for local incomes and water availability. *Land use valuation:* Externality from loss of biodiversity and eco-system services when land used. Most detailed analysis undertaken for Tier 4. Per hectare values for ecosystems based on TEEB values plus additional research. *Air pollution valuation:* 5 types of external cost included – negative health effects, reduced crop yields, corrosion of materials, effects on timber and acidification of waterways. Values based on literature reviews that derived averages per tonne of pollutant (often based on willingness to pay studies, adjusted for local factors, the sectors causing the pollution etc) or local market values. Clean-up costs used as a proxy for acidification. Recognised that other impacts could be valued but outside scope of study. *Waste valuation:* Landfill: Methane emissions valued using social cost of carbon (SCC). Future emissions discounted. Leachate costs based on quality of waste management per country. Disamenity effects valued using hedonic pricing – average costs calculated. Incineration: Valuation of GHG emissions based on SCC; air pollutants valued using methodology described above.	Overall impact 145m euros. Water usage and GHG emissions approx 47m euros each. Land use – 37m euros. Air pollutants – 11m euros. Waste – 3m euros. Tier 4 provided biggest share of impacts (57%).	Stated that costs would not affect net earnings.

Table 2.8: Summary of FCA applications since 1990 – Stream 3 (balance sheet/other focus)

	Date and name of application	Type of organisation and activities included	Internal costs and benefits identified (Ec/S/En)	Boundary set & external impacts identified (Ec/S/En)	Method(s) of monetisation	Impacts monetised	Linkage to P&L a/c and balance sheet (BS)
1	**Lamberton (2000).**	City Farm – an organic nursery, garden and produce supply business.	Not identified per se.	Direct En organisational impacts plus impacts of suppliers. Life cycle impact of veg box scheme (excluding life cycle of growing vegetables). Some S impacts identified. Impacts on natural and human capital identified.	Impacts not monetised – only eco-efficiency measures calculated (EG nursery contribution margin per litre of water consumed).	See left.	See left.
2	**Sustainable Value.** See references in footnote below.	Applied to companies in various industry sectors over a number of applications[48]. Key impacts arising from overall company activities.	N/a	Appears that boundaries narrowly set – not full life cycle (EG CO_2 from electricity generation and fossil fuels combusted during construction, but not wider). Ec, En and S impacts identified, EG: Ec – Earnings Before Interest and Tax (EBIT) or Net Value Added; En – CO_2, methane, NOx, SOx, VOC, dust emissions, water usage, waste produced. S – Work accidents & no. of employees.	Impacts generated/resources used (generally termed resources) not monetised per se in usual FCA fashion. Instead, financial value generated by company divided by 'resource' to give, for example, return per tonne of CO_2 emitted. Compared with benchmark return (either based on average for sample of companies examined or return generated by a national economy), regarded as the opportunity cost of the use of the economic, social and environmental resources. Difference multiplied by company resource usage to give measure of sustainable value. Calculation performed for all resources individually, answers added together and total divided by number of resources to avoid double-counting and give overall Sustainable Value Added (SVA'). SVA found to be negative for some companies.	See left.	N/a. Instead, return on use of resources (En and S in addition to financial capital) calculated in familiar investment return manner.
3	**Natural inventory model.** [subject of Jones 2003]	Valuation of natural inventory on land managed by Welsh Water (UK water utility company owned by Hyder plc); followed on from pilot study at publicly owned country park.	None identified.	Natural wildlife assets recorded rather than impacts identified per se. Types (and numbers) of habitat, and flora and fauna were identified. Once identified, all were then categorised as being either 'critical' or 'non-critical' (in reference to Gray (1992).	Monetary value attached to all non-critical habitats. Two methods used (and two separate valuations obtained): • Market use values based on subsidies paid to farmers and estate income (water supply, sale of sheep meat, visitor income and timber sales) over 20 years • Value based on an agri-environmental scheme	See left.	Pure B/S focus.

48 For example: 65 European manufacturing companies (Barkemeyer et al. 2006); 28 German companies (Hahn et al. 2007); 9 major chemical companies worldwide (Figge et al. 2009); 17 global automobile manufacturers (Hahn et al. 2009); 25 global pulp and paper companies (CO2 only: Barkemeyer et al. 2011)

Table 2.8: Summary of FCA applications since 1990 – Stream 3 (balance sheet/other focus - continued)

Date and name of application		Type of organisation and activities included	Internal costs and benefits identified (Ec/S/En)	Boundary set & external impacts identified (Ec/S/En)	Method(s) of monetisation	Impacts monetised	Linkage to P&L a/c and balance sheet (BS)
4	**Green Indian States Trust.** See Gundimeda et al. (2005a&b, & 2006) and Kumar et al. (2006 & 2007).	Indian NGO. Undertook the 'Green Accounting for Indian States and Union Territories Project' (GAISP').	Not applicable.	Attempted to publish state level green accounts for India. Developed environmentally adjusted GDP measures that accounted for all major externalities. Identified major Indian categories of natural and human capital, and then sought to measure changes in them. The capitals identified were: (a) timber, carbon, fuelwood, and non-timber forest produce; (b) agricultural cropland and pasture land; (c) forest biodiversity; (d) educational capital; (e) the ecological services provided by forests (soil conservation, water augmentation, and flood prevention); and (f) freshwater quality. GDP was then adjusted to take account of the changes in each category of capital. A variety of methods were used to value reductions in capital. For example, for agricultural land, replacement and maintenance costs were used to value nutrient loss and sedimentation problems respectively. For forest biodiversity, the recreational value of fauna was valued using the travel cost or contingent valuation (willingness to pay) method and non-use values of fauna were calculated using global willingness to pay rates.			Not applicable.
5	**TEEB.** See TEEB 2008, 2009, and 2010a&b.	UNEP hosted project to assist in the valuation of global biodiversity. Essentially a methodological framework to be applied to specific circumstances.	Not applicable.	Not applicable as TEEB study did not assess impacts for a particular context. It simply suggested a structured, tiered approach to valuation and presented best practice case studies and data gathered from a variety of literature sources.	Varied. For example, in TEEB (2010), a case study of the values of ecosystem services from tropical forests noted various studies that had used NPV, contingent valuation and choice modelling methods.	Varied – see left. Interim TEEB report however placed a broadbrush value on losses of natural capital per annum (arising from deforestation and degradation). Estimated at between US$2-4.5 trillion (TEEB, 2009 factsheet).	Not applicable.

2.8.3 Key methodologies – Forum's work and the SAM

Two FCA methodologies have been developed over time and used at multiple sites – Forum for the Future's[49] Environmental Cost Accounting (and later Sustainability Accounting) and the Sustainability Assessment Model originally developed at British Petroleum. Both will be described in some detail below. In particular, it is important to outline the SAM as due to its dialogic potential (highlighted earlier) it will be taken forward in this thesis in a new application.

The Forum accounting methodology was developed from earlier work by BSO Origin (see Huizing & Dekker, 1992), Rubenstein (1992 and 1994) and Bebbington & Gray (see Bebbington & Gray, 2001[50]). It began as Environmental Cost Accounting ('ECA') and developed into Sustainability Accounting ('SA').

Forum's SA methodology advocates the restatement and extension of the traditional profit and loss account, and the recognition of sustainability liabilities in the balance sheet (Bent & Richardson, 2003). As regards the profit and loss account, firstly, existing (but hidden) expenditure incurred during the accounting period on social and environmental areas is highlighted separately. Secondly, impacts created during the accounting period that are external to the organisation (and so do not appear in the accounts) are measured and then costed. The SA methodology advocates wide boundary setting and also a stakeholder approach to impact identification (the earlier ECA methodology adopted a 'narrow boundary' approach, in that it only identified impacts that the organisation was directly responsible for). The costing stage involves the use of avoidance/restoration costs, although damage costs were also applied in the AlcCo application (see Bent, 2004). The total avoidance/restoration cost figure can be deducted from accounting profit to give an alternative measure of profit, and a provision can be recognised in the balance sheet to reflect future avoidance or restoration expenditure.

[49] Forum is a sustainable development charity
[50] Bebbington & Gray's Sustainable Cost Calculation was applied to Landcare Reseach in New Zealand, and this included the study of a capital building project.

The Forum ECA methodology has been applied by Interface Europe, Anglian Water and Wessex Water; 'AlcCo' (an alcohol producer) and 'ChemCo' (a division of a chemical company) have applied SA. Forum itself has also sought to 'road-test' the methodologies in its own financial statements. Guidance on the approach is provided in the 'Sigma Sustainability Accounting Guidelines' (Richardson & Bent, 2003) and 'The Sigma Guidelines – Environmental Accounting Guide' (Howes, 2003a). Forum have recognised that the applications of their methodology have generally been very incomplete. For example, only the AlcCo application tackled social impacts (of an alcohol product), and none of the named applications tackled wider economic impacts.

The SAM (which was developed by BP, oil industry consultants, and Professor Jan Bebbington) assesses the economic, resource, environmental and social impacts (or 'flows') of a single project over its full life cycle and translates all impacts into monetary amounts using the damage cost approach[51]. Two outputs are produced – a graph that highlights all positive and negative impacts (the SAM 'signature'), and an indicator (the SAM*i*) that measures how sustainable the project is (with 100% representing a fully sustainable development). Figure 2.5 below reproduces a SAM 'signature'. BP applied the SAM to a typical, single oil and gas field development. The SAM has since been applied to a number of projects in the oil and gas industry, and it has been used to assess concept decisions for an off-shore hydrocarbon development and the performance of the UK oil and gas industry as a whole. It has also been applied to projects in other fields (for example, it has been used to evaluate energy extraction from landfill, a tree planting scheme, a salmon farm, City Council projects and a social housing project in New Zealand) (Baxter et al., 2004; Bebbington, 2007a; Fraser, 2010; Fraser, 2012). Further, it has been taken forward in an urban development form

[51] The initial SAM model was described in Baxter, Bebbington and Cutteridge (2002 & 2003). A significant body of more recent literature has either detailed the application of the SAM to various projects, design decisions or industrial sectors, discussed its potential for application to new areas, evaluated its ability to engender change, or documented its further development (see Baxter et al., 2004; Bebbington & MacGregor, 2005; Bebbington 2007a&b; Bebbington & Frame, 2007; Bebbington, Brown & Frame, 2006; Bebbington, Brown, Frame & Thomson, 2007; Xing et al. 2007&2008; Fraser, 2010; and Fraser, 2012).

by the SUE-MoT project (for example, see Xing et al., 2008).[52] The following paragraphs will examine the key characteristics of the SAM (the project focus, boundaries set, and impacts/'flows' identified) using the BP application as an illustration. The construction and urban development SAMs will also be examined.

A discrete project focus has been taken by the SAM as "this gives clearer visibility of the significant contributions to Sustainable Development and thus allows greater control over the resultant impacts (given that most companies organise their activities on a project basis)" (Baxter et al., 2004) – i.e., visibility is given to the contributions that a discrete project makes to sustainable development.

In the BP application, impacts associated with a typical oil and gas field development from 'cradle to grave' were identified (i.e., the analysis captured impacts arising from exploratory drilling through to decommissioning of the platform, plus impacts from refining, and manufacturing and use of oil and gas based products). The boundary was set widely, in that some impacts were identified over which an oil and gas company would have no direct control. An upper limit of 25 impacts was set to make the exercise more manageable, with impacts being selected according to significance and availability of data. 22 impacts were identified in the BP case. The data gathered was similar to that produced in company social and environmental reports.

The economic flow category of the SAM captures the total estimated income that the project will generate over its life, and splits this between the project costs that will be recorded in the financial statements of the entity. Therefore, this category represents internalised costs and benefits.

For BP, the economic benefit was calculated as the estimated number of barrels of crude oil that the field would produce, multiplied by an estimated selling price

[52] This follows the earlier proposal for a construction/property development SAM in Bebbington & MacGregor (2005).

of crude oil (to give total oil revenue). The SAM then splits the revenue according to the stakeholders who obtain the final benefit from it. For BP, the revenue was split between payments to contractors (such as suppliers and employees, and representing both capital expenditure and operating expenditure), shareholders (in the form of dividends) and the government (in the form of taxes), and the use of the remainder for social investment projects and reinvestment in the business. All impacts were positive in the BP case. All applications documented in the literature do not appear to have split the operating and capital expenditure identified to separately highlight expenditure to abate environmental and social externalities.

Figure 2.5 – the SAM 'signature'

Figure removed from e-version as third party copyright not obtained.

Source: Bebbington et al., 2006 (pp. 229)

The resource use flow category "attempts to capture the value of resources used, to the extent that payments made (and captured under economic flows) do not fully account for the use of resources" (Bebbington, 2007a, p. 43). Essentially, the loss of resources (in terms of them not being available for alternative uses) is measured, which leads to a negative impact. However, new resources generated (such as intellectual capital of individuals or the organisation) give positive impacts which will reduce the overall negative position. The BP application identified oil and gas, water, energy, raw materials, intellectual capital and infrastructure resources. The total opportunity cost of oil and gas, for example, was calculated as physical reservoir capacity (in units) multiplied by 'opportunity cost' per unit (lost value to society of not having the resource less cost to BP of acquiring resource) (Bebbington, 2007a). The societal value of oil and gas was obtained from the UK environmental accounts; indeed, values were generally obtained from the open literature (Baxter et al., 2003 & 2004).

Environmental flows caused negative impacts in the BP exercise, mainly due to the environmental damage caused by the use of oil and gas products. Four categories of environmental impact were identified – emissions to atmosphere and sea (including from the use of products), depreciation of properties arising from noise, odour and visual nuisance, land area unavailable for use due to installations (which would cause footprint and biodiversity issues), and impacts of waste created in the process of developing an oil and gas field. A variety of sources (both the open literature, and BP's own calculations) were used to compute physical impacts and associated damage costs.

Three social flows were captured in the BP case, giving both positive and negative impacts (and an overall positive position) – the impact of employment, the impact in terms of creating a more socially sustainable society, and the social impact of products. The positive impact of employment was measured in terms of value generated from direct jobs, being the multiplier effect that jobs generate in an economy (economic activity from wages paid). This was offset by the negative impact of deaths and accidents arising during employment (calculated as costs already paid in compensation etc). A project was deemed to lead to a more sustainable society if it tackled poverty and social exclusion, equipped people with the skills to fulfil their potential, reduced the proportion of unfit housing stock and reduced crime and the fear of crime. Taxation paid (over the life of the project) was used as the link between the above categories and the project, split according to UK government's spending patterns. Tax multiplier factors were estimated and applied. It was noted that this data was difficult to obtain. The major social impacts of products were identified as mobility, heating, and those associated with petrochemical-based products such as pharmaceuticals. The social impact of mobility, for example, involved a positive and a negative impact.

The positive impact was calculated as the difference between the crude price and current selling price of fuel (which was deemed to measure the value that people assign to mobility); the negative impact (costs of congestion and road accidents) was costed based on an existing study.

The figures calculated by the SAM are not explicitly linked to the P&L a/c or balance sheet (although, the environmental, resource and social monetary flows *could* be aggregated and the net figure deducted from/added to profit and credited/debited to the balance sheet as either a future liability or deferred income in the manner advocated by Forum – author's point). Instead, they are used to calculate the SAM 'signature' and 'SAMi' as noted above. Baxter et al. (2003) discussed how the positive and negative outcomes should be interpreted. They noted that there were four viewpoints that could be taken. The first viewpoint would regard all capital as substitutable. This would mean that if the total of all categories of capital (i.e., economic, resource, environmental, and social monetary figures aggregated together) were positive, then the project would be classed as sustainable. The second viewpoint would regard all capital as substitutable, except for critical natural capital. If the total of all capitals was positive, and there was no loss of critical natural capital (for example, no species extinction) then the project would be classed as sustainable. The third viewpoint would regard capital as not substitutable outside each capital sub-category, but substitution would be allowed within sub-categories (for example, job losses would be permissible if new jobs were created elsewhere). If any capitals were negative, action would need to be taken. A project would be sustainable when all capitals were positive. The final viewpoint would not allow a loss in any capital. All negative impacts would need to be remedied or designed out. The SAM takes the third option as it represents a reasonably mainstream view.

Bebbington & MacGregor (2005) propose (in broad terms) how the SAM could be applied to property investment by providing a framework for analysis. They anticipate the impacts that a property development might have under the SAM 'flow' headings, and use three sub-headings under each 'flow' – construction, location, and use. Table 2.9 below, which has been adapted from a Table in Bebbington & MacGregor (p. 11, with additional information from the same paper added), summarises their framework.

Bebbington & MacGregor argue that further work is required in a number of areas, but that it is more important to "…. collect the relevant data and to analyse it systematically within the SAM framework. This would allow specific gaps in the information to be identified." The areas noted as requiring further research are finance (in particular, Bebbington and Macgregor note the difficulties in obtaining finance for sustainable development projects – partially due to the non-inclusion in evaluations of longer term sustainability benefits or the heavy discounting of benefits attributable to future generations), and data allowing comparison of risks and returns from sustainable and non-sustainable developments.

An Urban Development ('UD') SAM has also been developed by the SUE-MOT project, and documented in a number of papers by Xing et al. Xing et al (2008) note that no integrated assessment tools exist to assess the sustainability of buildings and urban development (i.e., the economic, social and environmental impacts are looked at holistically), despite the complex and interconnected nature of urban planning. Existing assessment tools such as BREEAM are environment focused.

The UD SAM has therefore been developed to be such a holistic tool. It integrates a large number of sustainable development indicator ('SDI') sets, highlights environmental, social and economic impacts and adopts a life cycle approach that starts at the urban planning stage and goes through design, construction, operations, maintenance and demolition phases. The process of development involved the tool developers reviewing over 600 SDI sets and selecting the 24 most relevant. A detailed literature review examined SDI's developed under three categories – those developed at international/national/local level, those relating to construction and urban

<u>Table 2.9</u>: Construction SAM

Summary of the possible impacts of property development				
	Economic[53]	**Resource**[54]	**Environmental**[55]	**Social**[56]
Construction	Revenue of project split between: • expenditure on raw materials and utilities; • short-term interest; • development taxes; • development profit (income to investors) • capital re-investment.	• Materials used in construction • Consumption of utilities (water, energy etc)	• Pollution impacts from materials used in construction • Pollution impacts from consumption of utilities	• *Economic benefit* - provision of employment and training (multiplier effects)
Use		• Materials consumed in maintenance and refurbishment • Consumption of utilities (water, energy etc)	• Pollution impacts from materials consumed in maintenance and refurbishment • Pollution impacts from consumption of utilities (water, energy etc) • Waste	• *Economic benefits* (to occupiers and others) from use – dividends, local and national taxation, capital re-investment, capital and operating expenditure, rent and changes in market value, and provision of employment and training • *Contribution to a socially sustainable society* - urban regeneration and provision of social facilities • *Social value of 'product'* – rent
Location	• Cost of transport (of construction materials, for example)	• Energy consumption by associated transport network[57]	• Pollution impacts from associated transport network • Brownfield vs greenfield sites (& loss of habitat and environmental damage) • Risk of flooding	• *Economic impact* - scale and agglomeration economies[58] • *Contribution to a socially sustainable society* - accessibility and social exclusion

53 According to Bebbington & MacGregor, only the direct economic effects of the property development would be considered under the economic flow heading. Indirect economic consequences of the development from use and location would be considered under the social flow heading.

54 Information requirements per Bebbington & MacGregor – schedule of quantities (materials by type), and resource use per type of material. Utility quantity and resource use data would also be required. Presumably, the creation of intellectual capital and infrastructure resources could be added here.

55 Per Bebbington & MacGregor, issues concerning property design and trade-offs between project development costs and property operation costs would be highlighted and quantified here – and ecological footprint type analysis would assist (they refer to Chambers & Lewis 2001).

56 Three categories of impact = additional economic benefits, contribution towards a socially sustainable society (tackling poverty and social exclusion, skill training, improving housing quality and reducing crime and the fear of crime), and social impact of services provided by product.

57 Inner city locations linked to public transport networks are likely to be more energy efficient than out-of-town locations dependent on private car use per Bebbington & MacGregor.

58 Refers to optimal city size and economies of scale in provision of services per Bebbington & MacGregor.

development and those relating to wellbeing, happiness and other areas. Impacts were ranked according to their frequency of occurrence in the sets, and the popularity of indicators was corroborated – and stakeholders engaged – by the running of a workshop and the administering of questionnaires at an urban sustainability conference. However, the graphical illustration of the UD SAM tool as illustrated in Xing et al. (2008) does not appear as intuitive or easy to follow to the lay person as the earlier construction SAM, in my view. The UD SAM impact headings are more generic and provide less detail than the construction SAM. This will be picked back up in chapter 3 when looking for a suitable SAM variant to commence a new application.

A number of shortcomings of the SAM have been highlighted in the literature. For example, when it was applied by BP, only the 25 impacts of a typical oil and gas field development that were deemed to be the most important were recognized and monetized (Baxter et al, 2003). Further, the SAM utilizes damage costs, which have been heavily criticized in the literature (see discussion in Section 2.9). It has also been criticized for not seeking to define sustainability at the operational level, allowing substitutability between forms of capital (rather than setting minimum standards in certain areas, i.e. highlighting critical natural capital that could not be eroded), and adopting a life-cycle approach that forces an organization to report sustainability impacts that it has no control over (Accounting for Sustainability, 2006). Baxter, Bebbington et al. (2003) recognize, when justifying the BP SAM approach, the argument that organisations should only have to account for the impacts that they are accountable for. However, they justify their methodology by stating that it illustrates the impact of a project on sustainable development from the perspective of society.

In conclusion, the SAM appears to represent the most complete approach available that has actually been put into practice. Indeed, the most recent commentary on SAM applications (Fraser's 2010 study) did not note significant technical difficulties with the application of the SAM in the cases examined, although the focus of the study was on operational change rather than methods of impact identification and monetisation).

2.9 Arguments for and against FCA at the entity level

A number of arguments against FCA at the entity level have appeared in the literature that has chronicled FCA applications. It has been stated that placing a value on life, biodiversity etc is not morally acceptable as such attributes may have an infinite value (Antheaume, 2007); monetisation encourages the trading/substituting of impacts, which can cause degradation of natural capital (Bent & Richardson, 2003; Brown & Frame, 2005). Reliance on the work of experts might make figures inaccessible and difficult to understand (Brown & Frame, 2005; Heizerling & Ackerman, 2002). Making some things visible might make other things invisible when not all items can be monetised (Power, 1991; cited in Gray & Laughlin, 2012, p. 232). Various methods of monetisation have been criticised and it has been noted that FCA can convey the false impression that figures presented are scientifically accurate and objective when in reality scientific uncertainty makes them subjective and value-laden, and open to capture by management (Brown & Frame, 2005). Damage costs, which utilise demand side methods such as hedonic pricing and the travel cost method (both revealed preference approaches) or the contingent valuation method (Bent & Richardson, 2003) do not provide a cost estimate of improving matters to achieve a more sustainable outcome (Howes, 2002). The techniques are imprecise and subjective, and it is difficult to determine proportionate responsibility (Howes, 2000). Some costs are site specific and problems can occur when applying them elsewhere (although the accuracy of site specific costs could be seen as a strength); the availability of scientific data can also be a problem (USEPA, 1996; Atkinson, 2000; Antheaume, 2007). Per Pascual et al. (2010), while revealed preference approaches are based on actual market observations, they require large sets of data and complicated statistical methods (the choice of which will affect results). Hedonic pricing is dependent on the accuracy of the relationship between a surrogate market price (for example, house prices) and an environmental resource, and can be affected by market distortions and lack of information. Travel cost methods rely on restrictive assumptions about consumer behaviour. Contingent valuation (a questionnaire-based approach that models willingness to pay ('WTP') or willingness to accept ('WTA')) is sensitive to bias in survey design and the risk that hypothetical answers are not borne out in practice. Finally, WTP and WTA methods can provide differing answers. Herbohn (2005) noted that managers regarded WTP measures as 'ill-informed' (it was feared that they might overvalue popular species such as Koala Bears and undervalue ecologically important but unpopular species such as the venomous Western Taipan snake). The avoidance cost method has been criticized for producing costs that bear little relationship to environmental damage caused (USEPA, 1996; Antheaume, 2007), measuring the cost to an organisation of its external impacts on society but not the cost to society of the impacts (Bent & Richardson, 2003) and understating the impact on human well-being in over-polluting economies (Atkinson, 2000). Some avoidance costs have also been context-specific and not transferable (Antheaume, 2004). However, avoidance costs can provide an estimate of the possible future impact of policy intervention, can show the impact on the bottom line of environmental improvement expenditure and do not suffer with the subjectivity problems of damage costs (Howes, 2002).

Almost all the FCA applications undertaken that are included in Figure 2.4 have found it difficult to obtain costings for all impacts identified, irrespective of whether they have used damage costs or avoidance/restoration costs as the main basis of valuation. This has either meant that impacts have been left un-monetised, or the other method has been used as a proxy (i.e., avoidance/restoration costs have been used as a proxy for damage costs or vice versa). Further, multiple costings have sometimes been discovered when attempting to cost an impact, or the rigour of estimates obtained has been questioned. The extant applications have also highlighted many additional practical and technical issues with the accounting technology. For example, there has been: a failure to holistically consider organisational-wide impacts in some applications; a lack of consistency in identifying internal costs and associated benefits across applications; a mixture of narrow and wide boundary setting; and a failure to identify all external impacts because of variable rigour gathering data.

A number of counterarguments to the issues raised above have been presented in the literature, by commentators who believe that undertaking FCA is ultimately a valuable exercise[59]. (These are in addition to the argument noted above, i.e. the need for entity level FCA given only the partial use of policy mechanisms to correct prices.) Society already implicitly values human life when setting safety standards and suchlike, and so monetisation is not morally unacceptable. External cost evaluation methods only reveal and make explicit these values (Antheaume, 2007). Further, monetisation allows debate in a language that managers understand so that economic rationalism can be fought on its own ground (Bebbington et al., 2006). Specific benefits relating to FCA's two-stage monetisation process have also been identified. An exercise to identify internal expenditure can lead to improved environmental cost management (USEPA, 1996; Howes, 2002 & 2003b). The monetisation of external impacts can: embed sustainability in culture and operations (Howes, 2000); provide an early warning system to identify risks and assist in the gaining of competitive advantage (Howes: 2002 & 2003a&b); show more sustainable options in a better light (Rubenstein, 1994); facilitate rational and better informed discussions about sustainability issues and assist with strategic planning (Huizing & Dekker, 1992; USEPA, 1996; Herbohn, 2005); and highlight the value of governmental departments managing biodiversity "in response to increasing legislative, funding and political pressures" (Herbohn, 2005, pp. 4). Mattison et al. (2011) argue that it is in the interests of institutional investors to identify external environmental costs and to seek to reduce their exposure to them. Further, Adams et al. (2010) highlight ten 'business case' reasons why businesses should seek to value ecosystem services.

[59] Some of these arguments highlight the benefits to *organisations* of undertaking FCA and so come from a managerialist perspective.

A recurring theme in the literature is the potential power of the whole FCA process to educate and change attitudes and behaviour despite the practical limitations of the technology, and it is argued that this is where the real benefit lies (for example, see: Howes, 2000; Bebbington & Gray, 2001; Brown & Frame, 2005; Bebbington et al., 2006; Bebbington et al., 2007; and Brown, 2009). The process of engaging in FCA is more useful than the numbers generated and it is important not to place too great an emphasis on precise costs obtained (Howes, 2000; Bebbington & Gray, 2001). The SAM variant of FCA recognises this; the subjectivity of figures is explicitly acknowledged, space for non-monetary items is allowed (in 'bubbles' adjacent to the numbers) and the role of so-called 'experts' is diluted by the encouragement of all stakeholders to participate (Bebbington et al., 2006). Antheaume (2004) notes that even if external costs do not exactly model ecological effects, they are likely to change the perceived cost of an activity and so will influence strategic decisions. He concludes that "using cost evaluation methods assumes that, despite their limitations, using them to experiment with full cost accounting is better than not using them at all" (pp. 214). Further, Bent & Richardson (2003) argue that "it is better to be imprecisely right than precisely wrong when considering sustainability indicators" (p. 36) given the role that numbers can play in changing attitudes and selling change. (These arguments link back to the 'better to do something rather than nothing' arguments in Section 2.4.2).

2.10 Critique of existing FCA applications: (1) institutional theory lense

2.10.1 Initiating events (disturbances) and organisational fields

Only a minority of FCA applications appear to have been precipitated by significant disturbances or initiating events, namely: Ontario Hydro (1996); the New Zealand SAM applications studied by Fraser (2010); TEEB (2010); and PUMA (2011). The influence of an 'evangelical' individual appears to have driven the application at Ontario Hydro (Bebbington et al., 2001). Maurice Strong (who was appointed Chairman in 1992) was a leading advocate of sustainability, having been involved in the UN Brundtland Report and having been the Secretary General of the Rio Earth Summit. Per Fraser (2010), the New Zealand SAM applications were influenced by a Local Government Act which required councils to promote sustainable communities (the City Council applications), and a drive for sustainability by central government plus the enthusiasm of a CEO (the applications at the public sector housing provider). 'The Economics of Eco-systems and Biodiversity' ('TEEB') project hosted by UNEP was borne out of a decision by environment ministers from the G8+5 countries[60] in 2007 to "initiate the process of analysing the global economic benefit of biological diversity, the costs of the loss of biodiversity and the failure to take protective measures versus the costs of effective conservation" (TEEB, 2010a, p. 3)[61]. This could be seen as a supra-national disturbance. The PUMA application (2011) - although this has not been publicly stated by the company - appears to have been influenced by continual pressure on the sports clothing industry by non-governmental organisations and other sources (for example see Oxfam, 2006 for a report on the rights of workers and Greenpeace, 2011 for a report on water pollution arising from manufacturing processes), pressure that continues to the present day (for example, see Reuters, 2012 for a report of the shooting of a worker protesting at a factory in Cambodia manufacturing goods for PUMA).

Some other applications also appear to have been initiated by evangelical or driven/interested individuals operating at lower levels in organisations. For example, Bebbington (2007a) notes that the development of the SAM at BP was initiated by BP's sustainability co-ordinator (p. 37) to illuminate SD issues at the project level and to educate employees, and exploratory interviews conducted with the sustainable development charity Forum for the Future (see chapter 3 for

[60] The 'G8' = Canada, France, Germany, Italy, Japan, Russia, the United Kingdom and the United States; the '+5' refers to the emerging economies of Brazil, China, India, Mexico, and South Africa (TEEB, 2010).

[61] TEEB has produced a number of reports that have sought to assist in the valuation of biodiversity and eco-systems through the gathering of meta-data, the formulation of a structured, tiered approach to valuation and the presentation of best practice case studies. For example, the Interim Report (TEEB, 2008) highlighted the value of a Madagascan National Park as being $116.5m, and the 'TEEB for Business' summary (TEEB, 2010b) highlighted the contribution of insect pollinators to agricultural output as being ~US$190 billion/year.

more details) note the presence of evangelical people wanting to bolster arguments for sustainability and/or to scare senior managers when Forum conducted FCA applications with partner organisations. Further, “increasing legislative, funding and political pressures” precipitated the Herbohn (2005) application.

Many applications have also either been driven by the on-going work of academics (see application types marked ‘#’ in Figure 2.4) or non-governmental organisations (‘NGO’s’) (see applications types marked ‘$’ in Figure 2.4); evangelical and driven figures in their own right. As noted above, Forum for the Future was involved in both the development of FCA (including the writing of methodological guidelines, namely the ECA and SA guidelines) and the use of FCA internally in Forum and with a number of corporate partners. However, they discontinued direct work on FCA as their monetisation data had become outdated and FCA was not seen as a successful enough change tactic to invest more time and money in (Chapter 3 exploratory interviews). The Green Indian States Trust (‘GIST’) and TEEB have both worked on the valuation of biodiversity and eco-system services. Further, the Prince of Wales Accounting for Sustainability (‘PoW A4S’) project investigated FCA (see report of discussions in Chapter 3) and reported on the PUMA application at its 2011 Forum.

Organisational fields that might have driven the development of FCA do not appear to exist and one could speculate that there are a number of reasons for this.

Firstly, FCA applications have tended to be disparate and ad hoc with no critical mass forming in any one particular sector or industry, although there have been multiple applications in some sectors. The Ontario Hydro, Powergen and Epstein et al. applications have all been undertaken in the electricity generation industry, but they have been conducted in different countries and time periods and the latter two have been ‘shadow’ accounts conducted by parties outside of the industry. There have also been two applications in the UK water industry (Anglian

Water and Wessex Water), undertaken at roughly the same time, but the driver of these applications (Forum) has now abandoned FCA. Finally, there have been clusters of SAMs undertaken in the same organisation (for example, multiple SAMs undertaken in one City Council in New Zealand and multiple SAMs within BP), but these have not spread to all similar organisations in the geographical area (or if they have, this has not been recorded in the literature).

Recent applications however, published after the FCA application that this thesis has instigated, may have more of a chance of catapulting FCA into the 'mainstream' and generating organisational fields. The environmental data consultancy TRUCOST calculated that the largest 3,000 global listed companies produced negative impacts with a total monetary value of $2.15 trillion in 2008, as compared to negative impacts from the whole global economy of $6.6tn (Mattison et al., 2011). Further, both TRUCOST and PricewaterhouseCoopers ('PWC') worked with PUMA to value its negative environmental impacts for 2010 at 145m Euros. The Epstein et al. (2011) study valued the life cycle impact of coal used for electricity generation in the USA at $345.3bn per annum. These applications are significant for a number of reasons. Firstly, the calculations produced have generated headline grabbing numbers that have been widely reported and which have influenced debates and policy. For example, the TRUCOST global impact study was commissioned by the UNEP Finance Initiative and the UN-backed Principles for Responsible Investment, and the PUMA results were: presented to the German Council for Sustainable Development (which advises the German government); included as a case study in the UK Government's DEFRA White Paper in 2011; referred to in UNEP meetings; cited by a number of sustainability experts (all PUMA, 2011a); and presented to the PoW A4S 2011 Forum (Zeitz, 2011). Secondly, the figures calculated by TRUCOST were underpinned by an extensive body of impact data gathered by TRUCOST based on 464 business sectors and a sophisticated methodology based on a input-output econometric model (PUMA, 2011e), as well as monetisation factors gathered from meta-studies of the literature [such as Tol's (2009) study of 232 values of the social cost of carbon (PUMA, 2011i) and

TEEB-compiled eco-system values (PUMA, 2011f)]. It therefore appears that sizeable data sets are becoming available that can be used for FCA. Thirdly, it is planned that the PUMA calculations will be developed to include social and economic impact data (PUMA, 2011c), and the sustainability resources of the company have been increased (PUMA, 2011a). Fourth, PUMA's parent company are planning to roll out the EP&L to all of its luxury and sports and lifestyle brands by 2015 (PUMA, 2011a). These include well-known brands such as 'Gucci' and 'Stella McCartney' (PPR, 2012). Finally, PUMA has shared the results of its FCA application with other companies in the industry to engender change (PUMA, 2011a).

Secondly, the significant social actors that have entered SEAR fields (such as governments, organisations such as the GRI and the professional accountancy bodies) have not responded in the same way towards FCA. The policy environment has not generally been supportive of FCA and the accounting profession has been too conservative and client-driven to develop it (Bebbington et al., 2001). FCA has been proposed at global and European Union levels and has been recognised by individual governments and their agencies. However, proposals have failed to gain any traction and have not been backed up with legislation to date. Bebbington et al. (2001) reviewed the extant drivers at these levels. The Swedish government sought to include a pledge from multi-national corporations to use FCA in Agenda 21, a product of the Rio Earth Summit (1992), but this was diluted to an *invitation* to use FCA in the final agreement due to lobbying. The EC also identified FCA as a means of correcting prices and helping to deliver sustainable development in the EC Fifth Action Programme (1992). The Programme included a timetable for companies to adopt FCA (producing parallel accounts) and a call for the accounting profession to develop FCA. However, the proposal was set to fail as the accounting profession was not adequately guided - an assumption that it would innovate was incorrect due to its conservative nature and the fact that it was driven by business needs rather than itself driving business behaviour (Bebbington et al., 2001). No progress had been made by the time of the EC's Sixth Action Programme (2001), in which it was noted that 'measures remain valid, but they are largely a question of implementation on the ground'. Bebbington et al. (2001) also noted that there was no UK Government programme of work on FCA in 2001. A 1996 report by the Advisory Committee on Business and the Environment (set up to look at internalisation of environmental costs) had reported that there had been only partial internalisation, but that business competitiveness needed to be considered. Further, the Government Panel on Sustainable Development was aware of FCA but not developing it (it had reported in 1999 that development of environmental accounting at national level was the way forward). Milne & Gray (2007) also note a call by UNEP and SustainAbility for the internalisation of externalities.

Recent governmental developments offer encouragement and are in contrast to the findings above, although there are still no plans to legislate to make FCA compulsory. For example, the UK Chancellor of the Exchequer commissioned the Stern Review which reported to the UK Prime Minister and Chancellor in 2006 and which sought to monetise the anticipated impacts of climate change. Further, the 'TEEB') project has been noted above as an example of a supra-national drive involving a number of governments. Finally, the UK Government has recently embraced the principle of valuing natural capital in the Department for Environment, Food and Rural Affairs ('DEFRA') White Paper 'The natural choice: securing the value of nature' (2011). The paper proposed a **Natural Capital Committee**[62] and a**n annual statement of green accounts for the UK to** measure green growth alongside GDP (DEFRA, 2011b). The Paper also cited PUMA's EP&L as a best practice case study.

It has been noted above that the accounting profession is conservative and driven by client needs, and this has prevented it from developing FCA. However, there has been some interest amongst the UK-based professional bodies in FCA. ACCA and CIMA have sponsored/published a number of pieces of work directly related to FCA or involving FCA in some respect such as Bebbington & Thomson

[62] This committee met for the first time on 23rd May 2012 (DEFRA, 2012).

(1996), Bennett & James (1998), Jones & Matthews (2000), Bebbington et al. (2001) and Bebbington (2007a), in addition to investments in wider sustainability research and projects[63]. Accounting bodies and accounting practices have also engaged with various recent reporting initiatives such as the PoW A4S project and the International Integrated Reporting Coucil. Further, PwC has been directly involved in FCA calculations on the PUMA project.

2.10.2 Mechanisms/pillars and the (non)adoption of FCA

An application of the mechanisms/pillars introduced in Section 2.4.6 to FCA can usefully draw together some of the threads from the discussion above. Firstly, it can be concluded that no significant legislative or market pressure appears to exist for FCA (the coercive/regulatory mechanism). The one recent exception to this appears to have been the PUMA application, but in this case while FCA may have been a response to market pressures (as a type of reporting to regain legitimacy following criticism of the company), the market did not demand the adoption of FCA per se; FCA merely provided the company with a tool to use to demonstrate that it was serious about sustainability. Secondly, FCA has not become aligned with organisational norms, values, symbols and meanings (the normative and cognitive or mimetic mechanisms), for a number of reasons. Despite efforts of academics and NGOs, no consistent framework for FCA has been codified and accepted in the manner of (for example) the GRI, partly one could speculate because of the conservatism of the accounting profession. Further, business has found FCA to be problematic in a number of respects and so has not willingly adopted the technique. FCA has produced unpalatable and threatening costs that question the current claims of business organisations to be sustainable[64], make more sustainable alternatives seen too expensive and which

[63] Bebbington et al. (2001) also noted a number of reports by North American bodies that dealt with FCA (including the Ontario Hydro experiment) but did not offer any significant ways forward, such as CICA (1997), and the Society of Management Accountants of Canada (1996).

[64] Note the uncomfortable response of senior managers to the SAM in Fraser's study (2010) and Gray's (2010) assertion that social accounting experiments have been halted by organisations when they give the 'wrong' answers.

provoke fears of litigation, loss of value and competitive disadvantage[65]. It has also been seen to be technically difficult and costly and been regarded as not being accurate enough and not having enough credibility to satisfy the markets and the investment community. (These views were recorded in the exploratory interviews as noted in chapter 3.) This could be summarised as the technique being on one hand too uncomfortable because it problematises the status quo, and on the other hand not being acceptable as it does not fit with traditional, positivistic accounting which requires so-called accuracy and objectivity. (These issues correspond to Brown's (2009) barriers to a dialogic account noted in Section 2.4.4.) Finally, the sporadic nature of applications to date noted above, with no critical mass achieved in any particular sector, has meant that there have not been a great deal of applications for others in an industry to seek to imitate.[66] However, again, the PUMA application (as noted in the previous Section) may give an example for others to follow in the sports clothing industry.

All the factors above could therefore be seen as 'barriers to entry' for FCA as a new accounting technique, thus preserving the stability/inertia of organisations as predicted by institutional theory. Bebbington (2007a) noted when considering the adoption of the SAM across a number of entries that additional barriers to entry existed, relating to specific industry factors. (For example, in the electricity industry the SAM was not regarded as useful as it was felt that sustainability issues were already well documented and visible).

2.11 Critique of existing FCA applications: (2) organisational change lense

When reviewing the FCA literature, it is possible to ascertain some explicit cases of change or non-change, namely: Landcare Research, BSO/Origin and the Forum applications; Ontario Hydro; the various SAM applications; Herbohn;

[65] It has been noted that unless regulation requires FCA to be undertaken by all participants in a sector, then there is no incentive for any one organisation to undertake it alone.

[66] The exploratory interviews in chapter 3 did note that isolated/early adoptors of FCA had done so to: obtain data that could be used in negotiations with regulators; and to be seen to be on the leading edge of practice, exploiting opportunities and/or obtaining a competitive advantage.

PUMA; and Jones. However, it is not possible to do this in all cases as the literature has tended to be descriptive and has concentrated on the technical aspects of FCA (for example, what has been monetised and how). Each of the above named cases will now be considered in turn, benchmarked against Laughlin's organisational change framework. It will be determined whether the applications led to changes in the design archetype, interpretive schema and/or sub-systems of the organisation, and hence whether they led to first or second order change.

The Landcare Research, BSO/Origin and all Forum applications (Interface Europe, Anglian Water, Wessex Water, AlcCo and ChemCo)[67] appear to have either been driven by evangelical individuals in the organisations (although not individuals at senior management level) or 'business case' arguments (per Chapter 3 interviews). All applications led to partial changes in the design archetype of the organisation in that FCA appears to have become adopted for a period of time as one of the accounting tools used in the organisation. Whether FCA influenced decision processes or communication systems is less certain. Bebbington (2007b), citing Bebbington et al. (2001) and Bebbington & Gray (2001), notes that FCA led to relatively minor eco-efficiency improvements at BSO, Interface, and Landcare Research, suggesting that it did influence the decision processes in these organisations. Further, in the case of ChemCo, the application of FCA allowed the company to home in on one product and examine CO_2 savings (Taplin et al., 2006), and so it again appears to have influenced decisions. Anglian and Wessex Water disclosed the FCA environmental costs calculated as deductions from profit in a disclosure note in their financial statements (for example see: Wessex Water, 2000; and Anglian Water, 2000), so FCA became part of their formal communication systems. However, per the chapter 3 interviews, it was noted that while the numbers were being reported they were not being used for decision-making. What can be concluded is that there is no evidence of second order (morphogenetic) change to interpretive schema in the above applications. At best there appears to have been

[67] 'Stream 1' applications per Figure 2.4.

reorientation (cosmetic change), or at worst medium or long term rebuttal (the water companies appear to have discontinued FCA after reporting for a number of years, and Interface Europe stopped FCA on the advice of its American lawyers in case the monetisation of externalities led to lawsuits.

As noted in Section 2.10.1, the impetus for adoption of FCA at Ontario Hydro appears to have come from the company chairman Maurice Strong. This could be seen as an example of second-order, morphogenetic change – the organisation evolved by choosing to adopt FCA, leading to change to the interpretive schema, then the design archetype (monetised impacts arising from FCA were fed into a multi-criteria assessment decision-making process). However, Bebbington et al. (2001) noted that it appeared that the experiment had been discontinued, and that they had been unable to talk to anyone in the organisation about this. One could speculate that the departure of Maurice Strong might have disturbed the initial adoption.

Various applications of the SAM have changed the design archetype and affected perceptions of staff and decisions made in organisations at a project level (Section 2.4.3). However, no sustained second order change has been forthcoming. In Fraser's (2010) study of the social housing company in New Zealand, an initial evolutionary adoption of FCA driven by a CEO passionate about sustainability was restricted by the appointment of another CEO who adopted a 'business case' approach to sustainability. Further, the chapter 3 interviews note that the original BP SAM applications (instigated by BP's sustainability co-ordinator) did not permeate through the organisation – there weren't many people in the company who knew that it had been undertaken, which illustrates its non-effect on the culture, values and norms of the organisation.

The Herbohn study (2005) appears to have resulted in a rebuttal. No impacts were monetised due to funding cuts, political scrutiny and resistance from departmental managers.

The PUMA application (2011a-i), as noted above, appears to have been a response to continual criticism (seen as an external disturbance). It is probably too early to tell whether the application has caused first order or second order change. The application might turn out to be a reorientation (first order change); changes are cosmetic and the heart of the organisation (the interpretive schema) remains unchanged. Certainly, the design archetype has altered via the introduction of FCA and the external reporting of its results. However, second order change might be occurring due to a colonisation; the disturbance is so significant that the organisation has reacted by changing its interpretive schema and sub-systems too, with a new organisational ethos emerging. Certainly, the technique seems to have been championed by the senior management of the organisation and there are plans to extend its use further.

The Jones application (2003) is an example of a shadow account, produced outside the organisation studied (Hyder). The organisation rebutted the researcher's communications once the results were available (they did not respond to him), and so the exercise does not appear to have changed the organisation in any way.

In conclusion, it appears that FCA has achieved most success when it has been championed by senior management (Ontario Hydro, the early stages of Fraser's social housing study), as compared to when it has been undertaken at a lower level in the organisation (Forum applications, BP SAM) or where senior management have been wary of the technique (Fraser's later applications studied). One could speculate that when lower level managers have championed the technique, a tension/cognitive dissonance has emerged with the dominant interpretive schema of the organisation, and that this dominant position has eventually prevailed.

2.12 Critique of existing FCA applications: (3) dialogic lense

There is not enough information in the literature to critically evaluate all applications (excluding those studied by Fraser) using Fraser's DHF. However, it is possible to identify a few dialogic motifs in some of the applications. For example, the Forum AlcCo and ChemCo applications both identified some impacts by obtaining feedback from stakeholders. Further, when the SAM was developed at BP, the sustainability co-ordinator intended it to educate employees about sustainable development (Bebbington, 2007a), and Bebbington et al. (2006) note the dialogic potential of the SAM per se. It is also possible however to highlight some very non-dialogic motifs. For example, Forum abandoned FCA applications partly due to technical deficiencies – it was felt that conversion factor data was out of date. This implies that a positivistic view of the technique had been held. Further, the PUMA application, backed up by substantial data sets and work undertaken by TRUCOST and PWC, appears to have privileged the work of experts over (say) the voices of workers some distance down the supply chain.

2.13 Conclusions and justification for further research

Discussions thus far have highlighted concerns over SEA and the measurement of sustainability impacts per se, plus measurement at the level of the individual organisation (Section 2.4.2); managerial capture has been seen as an problem, a phenomenon exacerbated by the embedding of dominant views into institutional structures and the defending of these with pseudo-engagement and discursive de-coupling (Section 2.4.6). However, it has been argued that it is better to do something rather than doing nothing. Engagement should recognise the risk of capture but not be constrained by it (Section 2.4.2).

FCA has been put forward as a type of SEA that can 'correct' prices and disturb or problematise the capitalist status quo – in other words, a potential agent of change. However, the monetisation of impacts has been criticised (both per se, and for the manner of monetisation) and applications of FCA have encountered many difficulties in practice, which has led to the conclusion that extant applications of FCA have been ad-hoc, experimental and incomplete, with little consistency in practice (for example note Antheaume's application, which converted less than ten percent of flows into monetary amounts)[68]. Further, it has been found that SEA (and FCA) has not so far brought about emancipatory change in organisations (Sections 2.4.3, 2.10 & 2.11). FCA has not tended to have been fully embraced in the organisations in which it has been applied, it has not been utilised on an on-going basis following initial calculations, and it has not achieved a shift in 'worldviews' within the organisation.

However, in the spirit of doing something rather than nothing FCA has been seen as being a worthwhile endeavour, however flawed it might be. It has also been argued that FCA conducted in a dialogic and democratic form can be a powerful educator and agent of change (especially if monetisation is not absolute, the subjectivity of figures is explicitly acknowledged, and expert input is diluted by input from multiple stakeholders), and the SAM has been advocated as a form of FCA suitable for such an approach. However, only one empirical study to date has focused on the extent to which a sub-set of SAM applications have been dialogic and have precipitated change, and extant FCA applications in general have not been explicitly or consciously conducted in a fully participative or dialogic fashion. Therefore, it could be argued that the claims made about participative and dialogic versions of FCA lack proof and require further testing – there have been insufficient dialogic applications to assess the potential positive benefits to date. Further, there have been calls for greater researcher engagement at empirical sites, including action research (Section 2.4.3).

There have been recent calls in literature to persevere with FCA and to undertake new applications of FCA to 'iron out' problems inherent in its implementation (Section 2.8.1). For example, see Antheaume (2004 & 2007), Milne & Gray (2007), Unerman et al. (2007b) and Frame & Cavanagh (2008) in

[68] Applications conducted with a pragmatic attitude (Forum-led and SAM) appear to have been more successful.

addition to Brown & Frame (2005) and Bebbington et al. (2006). Frame & Cavanagh argue that the SAM is a model in its metaphoric teenage years that requires further development; Antheaume (2007) argues that scientific and data quality advances might now make FCA easier to perform, and that more work is needed to better understand how economic, social and environmental aspects of an entity interact with each other[69]. Bent and Richardson (2003) note that more work is required on: external economic impacts and how these contribute to financial capital; inclusion of positive external impacts; linking flows to stocks; and on developing standardized and sector specific methods (to allow comparisons between FCA applications). Bebbington et al. (2001) suggest an action plan to take FCA forward, which involves: (a) making externality data more widely available; (b) developing a more robust and widely accepted approach to FCA, by drawing on existing applications, testing and evaluating an approach once developed and disseminating the results of the exercise; (c) applying the approach to a number of specific situations to field test and experiment; and (d) developing an education and practical guidance programme. (p. 133-136)[70].

Given the above, this author believes that the application of a revised FCA model in a new organisational context (using an explicitly conscious dialogic approach) is therefore required, to: (a) further evaluate the difficulties inherent in the FCA process; (b) determine whether advances in scientific knowledge and sustainability awareness now make FCA calculations more feasible (as compared to previous FCA applications); and (c) ascertain whether FCA engagements conducted in an explicitly dialogic manner lead to organisational change.

How might a consciously dialogic approach be undertaken? FCA might benefit from using an 'off the shelf' research strategy that has not previously been used

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69 Antheame had earlier argued (2004) that more research and experimentation was required if FCA was to become more widespread. He noted that if more FCA experiments became available in the open literature it should be possible to see if different costing methods contradicted each other and why, which would greatly contribute to better assessing the quality of decisions based on FCA.

70 The DHF regards a standardised approach suitable for benchmarking as undialogic. However, it could be argued that a degree of standardisation and robust prior data allows a dialogic approach to flourish as it provides a base from which people can work from.

in a FCA context. Action Research is such a research strategy. It consciously incorporates dialogue, democratic participation, reflection and learning as standard, and so its principles bear a strong resemblance to the dialogic theories and frameworks laid out in Section 2.4.4. Chapter 3 provides details of – and critiques – action research, and justifies the use of its soft systems methodology ('SSM') variant for a new FCA application, while highlighting the links with the dialogic discussions above.

Fraser's DHF (plus elements of Bebbington et al.'s (2007) work and Brown's (2009) CDA) will be used to critically evaluate the extent to which the new application is dialogic. The type of change that may or may not occur will be benchmarked against Laughlin's organisational change framework (Section 2.4.5), assisted by SSM analysis tools (the 'finding out' analyses and 'root definitions'). Further, the reasons for change (or resistance to change) in the sector of the new application will be predicted using the critical institutional theory introduced in Section 2.4.6 and applied to FCA in Section 2.10.

It is however useful at this stage to articulate some possible expectations of the new application. One could imagine a range of outcomes, namely: a utopian outcome (being the best possible outcome); a 'worst-case' outcome; and a pragmatic, realistic outcome (based on lessons from existing theory and applications discussed in previous sections).

2.13.1 A utopian outcome

The best possible outcome of the new application would involve: a fully dialogic model building process and full cost account (as benchmarked against Fraser's DHF (2010), Brown's CDA (2009) and Bebbington et al.'s (2007) dialogic motifs); a high percentage of activities converted into impact data and the impacts monetised where appropriate, with no technical difficulties; and second-order, morphogenetic change occurring.

A fully dialogic account would be undertaken with the purpose of engaging in critical reflection of the project studied. The process would involve problematisation, reconceptualisation and action, with the project itself being changed if that was felt appropriate and participants empowered to make those changes (the transformative potential of dialogic accounting would be recognised and the account used as a tool for dialogic learning). The account would not be used purely as a tool for dominant views to be espoused and existing decisions to be legitimated (perhaps via discursive de-coupling); instead, power elites would be challenged, and participatory processes would be ensured to be effective. One project would not simply be benchmarked against another. The content of the account would be unpredictable, polyvocal (allowing many different viewpoints and stakeholders to be heard) and always regarded as subjective, contestable, and a version (or versions) of events rather than providing *a* 'correct' answer and *the* definitive version. Multiple accounts might be produced. Monetisation would only occur when appropriate and other styles of account might be presented too (for example, narrative accounts). A broad range of people would contribute, without privileging the views of so-called experts; the account would be accessible for non-experts, and experts would learn from non-experts. Communication of the account would not be restricted and would take place both within and outside of the boundary of the organisation; communication would not be restricted to formal channels and managed to hide 'inconvenient truths'. Timescale studied would tend to be long-term, scale would be flexible (rather than being aggregated to avoid sensitive disclosure) and everyone who had an interest would be seen as owning the account.

The identification of a high percentage of impacts (by a large number of stakeholders) and the monetisation of those impacts where appropriate would ensure a holistic account; if a large amount of data was inaccessible it might make the learning exercise less effective and ultimately frustrating. Further, while the subjectivity and contestability of calculations would always be stressed, and the expertise of so-called experts would always be questioned, the adoption where possible of factors that could be triangulated with others and had a basis in peer reviewed academic literature might be viewed by participants as preferable to isolated factors drawn from the gray literature. What would be seen as a high percentage? In the BP SAM application, an attempt was only made to monetise the top 25 impacts (and 22 were monetised). In contrast, the Antheaume (2004) application monetised less than ten percent of the ‘flows’ identified. A utopian application would be able to measure and monetise however many impacts were deemed necessary, and data gathering would not be difficult.

Second-order (morphogenetic) change would arise from the account. The interpretive schema of the organisation (beliefs/values/norms, mission/purpose and meta-rules) would change – i.e., the underlying ethos of the organisation would change. This would either require a colonisation (caused by the disturbance of undertaking FCA) or would be an evolution arising from management’s decision to adopt FCA in the first place to lead to change.

2.13.2 A worst-case outcome

A worst-case scenario would see: a wholly non-dialogic account (as alluded to in the section above and explicitly set out in the right-hand column of Table 2.1 in Section 2.4.4) and severe difficulties in gathering data. Such a scenario might be precipitated by the attitudes of senior management to the undertaking of a full cost account. Indeed, the account might be curtailed if it started to challenge a dominant position (a rebuttal), or it might become sidelined and marginalised (a reorientation). In either case there would be no second-order change occurring. However, even this outcome would not be totally negative; having to rebut something challenging would at least force senior management to think about the unsustainability of their project, even the decision was then to hide this truth.

2.13.3 A pragmatic, realistic outcome

A realistic outcome might sit between the two outcomes already outlined. The account would have dialogic motifs corresponding to the left-hand column of

Fraser’s DHF table (Table 2.1) but also some un-dialogic motifs. For example, while one might imagine that senior management would be happy for poly-vocal debate to go on behind closed doors, they might not wish the whole exercise to be played out in the public domain during what might be a sensitive time for a project. Further, the results of the account might not be able to influence the outcomes of a project due to timing issues. Also, for the new application, given the resources and time available a pragmatic decision has had to be made to produce just one model and set of calculations (incorporating all views as much as possible), rather than multiple versions. The approach will thus be based on deliberative democracy rather than agonistic democracy per se, although as the action research variant used allows participants to construct their own models based on individual worldviews before an accommodation is reached on a common model then agonistic motifs will be present.

Secondly, a reasonable amount of impact identification and monetisation might occur (for example, the majority of impacts identified might be measured and monetised), although some data would be difficult to gather and the quality of data might be variable in certain cases with some data sourced from the gray literature and not able to be triangulated.

Thirdly, second-order change might occur but this would not happen quickly; it might require the consistent use of FCA in the organisation to assess a number of projects over a period of time to assist in a slow colonisation. One might therefore instead observe, in the short term, reorientation (for example, adoption of FCA as a check on other projects). Further, FCA might also experience some of the barriers to entry identified in Section 2.4.6 as predicted by institutional theory. One might expect change to be less likely if: there was no pressure in the sector (regulatory, market) to engage in the quantification of sustainability impacts; there were not early adoptors of FCA in close proximity; and if FCA would create dissonance and challenge existing norms and values to the extent that it would problematise the status quo and not fit with an expectation for traditional, positivistic accounting requiring accuracy and objectivity. Further, a dominant elite may exist intent on maintaining the institutional status quo. They might be willing to sanction pseudo-engagement with stakeholders, with heretic discourses being allowed to join the debate but discursive de-coupling leading to an end-product account that favoured a managerialist, business as usual, weak sustainability viewpoint.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter chronicles the development and use of a suitable methodology for a new FCA application, given the justification in chapter 2 and the research objectives generated. The methodology was developed between the Autumn of 2007 and the Summer of 2008, and applied to a case study organisation between 2008 and 2011 to build and use a new FCA model in a dialogic manner. The case study organisation was originally approached in the Autumn of 2007, and the feasibility of the case study was appraised as the methodology was developed. The methodology development was aided by presenting and obtaining feedback at a number of conferences and seminars during 2008. Presentations were made at the BRASS Centre lunchtime seminar series (13th June 2008; see Davies, 2008a) and the 12th Annual Financial Reporting & Business Communication Conference, Cardiff Business School (3rd – 4th July 2008; see Davies, 2008b). A draft methodology *paper* was also presented at the 20th International Congress on Social and Environmental Accounting Research, University of St Andrews (September 3rd – 5th, 2008; see Davies, 2008c).[71]

The development of the methodology occurred in three stages. Firstly, it began with interim research undertaken to assess attitudes towards and usage of FCA not recorded in the literature[72] and prior problems with the development of FCA. This research involved the undertaking of informal discussions with an organisation that had previously developed and applied FCA in a number of contexts and a current developer of new sustainability measurement tools, and is

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71 This paper was further developed and presented at three conferences/symposia in 2009: the 1st Annual MBA Conference, University of Wales, Newport, (26th March 2009; see Davies, 2009a); the BAA/ACCA/CSEAR One-Day Symposium on Corporate Governance, Environmental Accountability and Social Responsibility, London (27th May 2009; see Davies, 2009b); and the 1st International Conference on Sustainable Management of Public and Not For Profit Organisations, University of Bologna, 1st - 3rd July 2009; see Davies, 2009c). A commentary was included in the paper on the usage of the methodology to develop initial models. The contents of the final paper now appear across Chapters 2, 3 and 4 of this thesis. The paper was also cited in Jones (2010), a work to which this author assisted regarding the operationalisation of FCA.

72 Given the relatively lengthy review and production times associated with academic journals

detailed in Section 3.2. Key findings have already been integrated into chapter 2. Secondly, existing methodologies available in the literature were reviewed and critiqued. This author felt that FCA might benefit from using an ‘off the shelf’ methodological framework that had not previously been used in a FCA context. Given that commentators have argued that the educational impact of the FCA process (rather than the end figures produced) is it’s most beneficial output, and that the educational impact is at its most powerful when the process is dialogic, participatory and democratic, then it made sense to adopt a methodological approach that incorporated dialogue, participation, reflection and learning as standard. The development of the approach was also influenced by an extant research project that was being conducted by Solomon into pension fund trustees’ attitudes towards (and roles and responsibilities in relation to) climate change. Importantly, the Solomon study was motivated by the belief of the researcher that trustees should be engaging with climate change and that the study should seek to influence interviewees. The research, which sought to embed learning in an iterative process, adopted action research and soft systems methodology themes.[73] This author therefore explored the generic action research literature (such as Greenwood and Levin (1998), Newton (2006), Reason & Bradbury (2006) and Coghlan and Brannick (2005)), as well as *variants* of action research such as action science and soft systems methodology. It was felt that these may be appropriate methodologies to utilise to develop and apply FCA, as they are built on dialogue and democratic participation. It was decided that Soft Systems Methodology (‘SSM’) should be utilised, as while it contains the standard action research motifs, it casts the process of enquiry as a system and adopts a structured task approach to each stage. (It therefore addresses the major criticisms often levelled at action research - that it is unstructured, unscientific, and open to researcher bias – and allows the criteria of ‘recoverability’ to be satisfied.) A detailed critique of action research and SSM is contained in Section 3.3. Thirdly, the standard SSM learning for action (‘SSM LFA’) cycle was amended to fit the case study

[73] The initial research was eventually published in 2009 (see Solomon, 2009a), with a follow-up report shortly after (see Solomon, 2009b).

organisation and the building of a FCA model. This process is detailed and critiqued in Section 3.5.

Section 3.4 of this chapter introduces the case study organisation (a university, 'University X', in the Higher Education ('HE') sector in the UK) and justifies the use of the organisation and the sector as a suitable test-bed for a new FCA application. Research undertaken highlighted that there were a lack of holistic sustainability measurement tools available in the sector and that the case study organisation was not holistically monitoring its sustainability impacts. Section 3.4 hence provides the background and context for the discussion in Section 3.5.

In sum, chapter 3 highlights the first significant contribution of the thesis – the development of an amended SSM LFA cycle. It should also be noted that the methodology developed allowed the research objectives noted in chapter 2 to be achieved. A new FCA application, with quantitative outputs, satisfied objectives (a) and (b). Further, the dialogic process (and in particular specific interviews conducted at the beginning and end of the process as detailed in Section 3.5) satisfied objective (c).

3.2 Interim research undertaken to assess usage of and problems with FCA

The author held an informal telephone discussion with a member of staff who worked for the sustainable development charity Forum for the Future (coded as W1) in October 2007. As noted in chapter 2, Forum had been involved in the development and use of FCA and W1 had worked on the project. Forum had worked with a number of corporate partners and had helped them to apply FCA. However, direct work on FCA had been discontinued as the monetisation data had become outdated and FCA was not seen as a successful enough change tactic to invest more time and money in (W1 had previous presented on this at the 2006 CSEAR Conference; see CSEAR, 2006).

The author also held a telephone interview with W2, who was working for the Prince of Wales Accounting for Sustainability project (hereafter referred to as the 'A4S project') in December 2007. The interview was undertaken as the overall concept of FCA appeared to have been considered as part of the A4S project, but FCA had not been adopted wholesale. For example, FCA (in the form of the Sustainability Assessment Model) was briefly reviewed in the December 2006 A4S research report (Accounting for Sustainability Group, 2006), and FCA was also mentioned in the 'launch' speech by HRH the Prince of Wales (HRH Prince of Wales, 2006). Further, the Connected Reporting Framework (Accounting for Sustainability Group, 2007) had highlighted existing environmental expenditure, and the environmental emissions indicator category appeared to include a measure of the 'full' external cost of carbon emissions. Interview questions were therefore set to determine:

(a) the extent to which FCA was considered throughout the A4S project;
(b) the attitudes of parties consulted by the project towards FCA; and
(c) the reasons why FCA in its 'fullest' sense had not been adopted by the A4S project in its Connected Reporting Framework.

3.3 A methodological framework to develop and apply new Full Cost Accounting models

3.3.1 Action research - background

Action research has been defined as "social research carried out by a team encompassing a professional action researcher and members of an organisation or community seeking to improve their situation" (Greenwood and Levin, 1998, p. 4); "a type of applied social research that aims to improve social situations through change interventions involving a process of collaboration between researchers and participants. The process is seen to be both educational and empowering" (Newton, 2006, pp.2); and "a participatory, democratic process concerned with developing practical knowing in the pursuit of worthwhile human purposes, grounded in a participatory worldview" (Reason & Bradbury, 2006, p.1)[74]. Importantly, action research wants to change the world as well as understand it (Coghlan and Brannick, 2005).

Greenwood and Levin state that action research consists of the following stages, which must all involve both the researcher (acting as a facilitator/teacher) and stakeholders: (i) definition of the problems to be examined (where all parties set the agenda); (ii) the generation of relevant knowledge about the problems identified; (iii) the learning and execution of social research techniques; (iv) the taking of actions; and (v) the interpretation of results of actions based on learning. Further, they argue that three key elements must be present for research to be classed as action research – research, participation (i.e. a democratic process) and action (conducted with the aim of altering an initial situation). Newton (2006) cites Waterman et al. (2001), who argue that action research involves a cyclic process of intervention and evaluation (Lewin's action research 'spiral'), and partnership/collaboration between the researcher and the researched as a device to reduce the distance between them (this is a break with traditional research, which argues for separation between the two parties to ensure objectivity).

3.3.2 The epistemological and ontological positions of action research

Both Greenwood and Levin (1998) and Reason and Bradbury (2006) link action research to the critical theory and pragmatic schools, and the works of Dewey (who believed that all real knowledge comes from action) and Lewin (who is widely accredited as coining the term action research and for stating that the best way to understand something is to try and change it) are cited and brought to the fore[75]. Greenwood and Levin also link action research to Freire's work on dialogics, and to general systems theory ('GST') (they argue that the notion in

[74] Per Checkland (2000), different worldviews reflected different perspectives or viewpoints.
[75] For example, see Lewin (1935, 1943 & 1948) and Dewey (1900 & 1991).

GST of the world as a complex web of constantly changing interacting systems that needs to be examined holistically underlies action research).

Coghlan and Brannick (2005) align action research with critical realism (an approach related to scientific enquiry). They argue that the approach has a subjectivist epistemology (i.e. knowledge is context-driven, there is no single reality, the social world is complex, and the researcher is close to the data and cannot measure it without changing it) but an objectivist ontology (social and natural reality have an independent existence prior to human cognition). They argue that the "basis for validation is the conscious and deliberate enactment of the action research cycle". They also describe the researcher as both a detached observer and agent of change (per Evered and Louise, 1981). Riorden (1995) is quoted as defining action research as "a kind of approach to studying social reality without separating (while distinguishing) fact from value; they require a practitioner of science who is not only an engaged participant, but also incorporates the perspective of the critical and analytical observer, not as a validating instance but as integral to the practice".

3.3.3 A critique of action research

Newton (2006) argues that action research might appear to be unscientific (if judged by standards of conventional academic research), as: (i) the close and collaborative relationship between the researcher and the researched is a source of bias as the researcher is no longer independent; and (ii) it is flexible in its design (it advocates a fluid and ongoing process of formulation, implementation, adaptation and evaluation not specified beforehand in a research protocol). Action research narrative has also been dismissed as storytelling (Greenwood and Levin, 1998). However, Newton states that given the marked differences with conventional research, it may be better to judge action research on its own terms. Outcomes are not necessarily 'findings' in the conventional sense of theoretical progress, but changed behaviour, practices etc. Newton concludes that action research has a considerable contribution to make in the management of change.

Greenwood and Levin argue that action research is more scientific than traditional social science, because it continually links theory and action and judges theory by whether or not it can resolve real-world problems. If extant theory does not work in a particular case, then it will have to be altered. The so-called 'objectivity' of traditional social science is rejected as being false and simplistic. Greenwood and Levin also cite Argyris et al. (1985)'s defence of their strand of action research, 'action science'. Action science is based on the premise that social actors defensively react to proposals for change, and that these reactions ('defensive routines') inhibit the solving of problems. Argyris et al. argue that to understand the reasons for the maintenance of defensive routines, they must be confronted by intervention in the situation. Without this intervention, it is not possible to obtain a valid understanding – and therefore traditional 'objective' social science research is inadequate.

3.3.4 An appropriate version of action research to develop FCA

The above discussion illustrates that action research has attributes that closely fit with the dialogic, participatory and democratic processes highlighted in chapter 2 as being best suited to the development of FCA; action research incorporates dialogue, participation, reflection and learning as standard. It therefore made sense when designing the methodology to use a variant of action research to develop a new FCA model. Initially, however, this author was troubled by the unstructured and fluid nature of action research and questioned whether it could yield a quantitative accounting model in a disciplined fashion. The 'generic' action research techniques and examples espoused by authors such as Greenwood and Levin, Reason and Bradbury etc did not seem appropriate – they appeared best suited to altering *organisational* rather than *accounting* problems. Further, not all action research variants seemed appropriate. For example, the confrontation of defensive routines espoused by action science did not seem relevant to the building of a FCA model. However, Soft Systems Methodology ('SSM'), with its structured form of enquiry, was deemed more suitable. It was road-tested by using its 'rich pictures' and 'learning for action cycle' techniques to sketch out the particular circumstances and problems of the case study chosen; they appeared to fit very well within the confines of the SSM techniques. See Section 3.5 for commentary on the application of these techniques to the case.

SSM was developed from a systems engineering approach by Peter Checkland, using action research (Checkland and Poulter, 2006; this provides a comprehensive overview of SSM, and forms the basis of the discussion below). SSM offers a structured means of undertaking action research as it casts the process of inquiry as a system (although it does not subscribe to the belief that organisations are systems – a common misconception in the literature according to Checkland and Poulter). It therefore addresses the criticism levelled at action research highlighted above – that it is unscientific due to a fluid and flexible design.

SSM has been defined as: “an action-orientated process of inquiry into problematical situations in the everyday world; users learn their way from finding out about the situation to defining/taking action to improve it. The learning emerges via an organised process in which the real situation is explored, using intellectual devices – which serve to provide structure to discussion – models of purposeful activity built to encapsulate pure, stated worldviews.” (Checkland and Poulter, 2006, p. 22). SSM contains the standard action research motifs – dialogic and democratic participation in cyclical learning processes by the researched and the researcher (incorporating a framing of the research problem), planning for action, the action itself, reflection, and further action. Its major strength is that it adopts a structured task approach to each of these stages that utilises carefully defined language. (For example, the initial identification of a problem involves information gathering and the sorting of information under three pre-set headings.) According to Checkland and Poulter this allows SSM to satisfy the criteria of ‘recoverability’, whereby the researcher explicitly records the process in such a way that an outside observer can understand it and the outcomes. It also makes it possible to set out in advance of a study what will count as knowledge generated from that study. Further, SSM has the advantage of being a well-used, ‘mature’ methodology (a label afforded by Checkland and Poulter).[76]

The SSM process is set out in diagrammatical form in Figure 3.1 below. SSM utilises many hand-drawn diagrams, and an example of an author-drawn diagram is given in Figure 3.2a. According to Checkland and Poulter, this illustrates the ‘work-in-progress’ and educational nature of a typical SSM exercise. The diagram clearly illustrates the standard action research ‘motifs’ – problematizing, dialogue, action, and reflection – and the structured and systemic nature of the process.

Checkland & Poulter state that researchers can utilise the parts of the SSM methodology that suit them – i.e., they do not advocate that all stages have to be followed slavishly. This was certainly the case in the Solomon studies noted earlier, which picked up SSM themes but not the rigid structure.

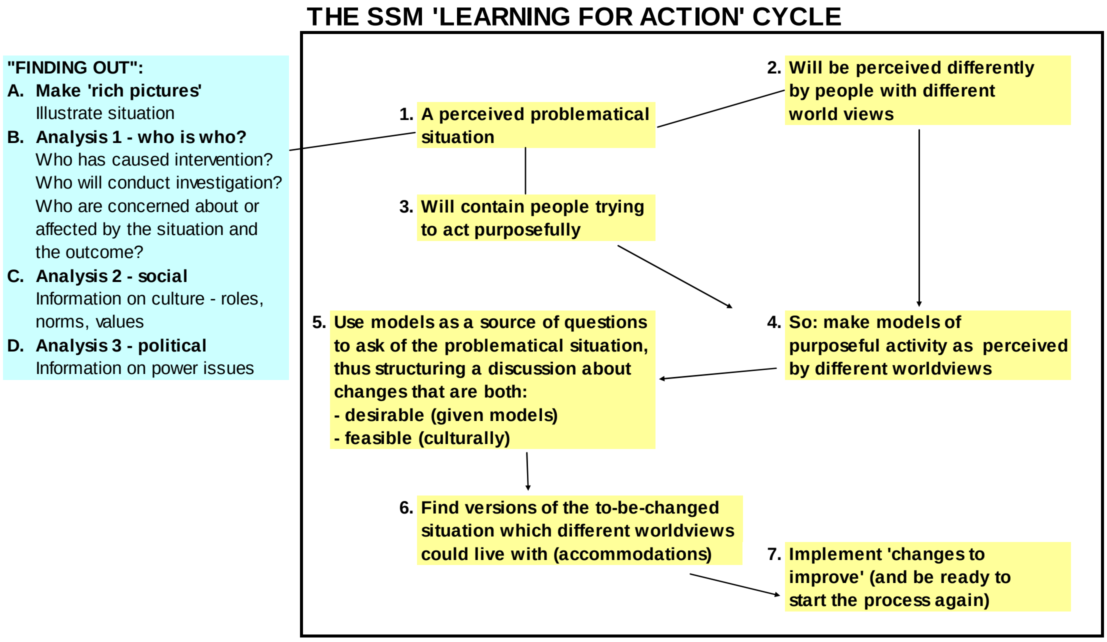
3.4 A new application of FCA in a HE setting, at ‘University X’

3.4.1 HE sustainability performance

At the time that the thesis methodology was being developed, there were significant calls by government bodies and pressure groups for the UK HE sector to improve its sustainability performance and demonstrate its sustainability credentials – and these are detailed in chapter 4, Section 4.3. Further, formal ‘finding out’ interviews with the management of one UK university (see below and Chapter 4), and a review of relevant literature revealed that (a) UK HE institutions did not appear to be measuring their sustainability impacts in a holistic way; and that (b) no HE institution had yet sought to apply FCA (and hence monetise it’s impacts to correct prices).

[76] Given the number of applications that Checkland & Poulter describe, over a considerable period of time, this claim appears to be reasonable.

Figure 3.1 – The SSM 'learning for action' cycle



(Source: Adapted from Checkland & Poulter, 2006, preamble xix & p. 170).

These facts provided the first plank in an argument to justify the application of FCA in a new, public sector, HE setting – there was a knowledge gap in the sector (i.e., a lack of information on the true cost of the activities of institutions) that FCA could fill. Secondly, HE institutions are in a unique position to disseminate the benefits of FCA to a wider audience; how better for them to argue for the take-up of a sustainability accounting technique than to demonstrate its use in a real setting?

3.4.2 The selection of a case study organisation and a chronology of the early stages of the project

This author has the worldview that if an organisation is underperforming in terms of measuring its sustainability impacts, an attempt should be made to intervene to alter behaviour. A case study organisation based in the HE sector ('University X', a university situated in a city in Wales, UK) was provisionally selected in the Autumn of 2007 to undertake a new FCA application, subject to feasibility. The university was selected as it did not *appear* to have been holistically measuring and controlling its sustainability impacts.[77] There was hence scope to provide significant information and educational benefits to the organisation by undertaking FCA. Further, University X was planning to construct a new campus at the time ('Campus C'), which would involve the university closing an out of town campus in a residential area ('Campus A') and building the new campus in the city centre.[78] There was hence a clearly defined project to which FCA could be applied. It also appeared that the sustainability impact of the new campus was not being holistically measured. A BREEAM[79] assessment of the new build plan was being undertaken (it was required that the building achieve an 'excellent' rating to secure grant funding), but this concentrated on scoring particular

[77] This author was employed by University X for the duration of the case study; this therefore gave the initial insight into the sustainability performance, as well as ease of access to data. The advantages and disadvantages of employees researching their own organisations are discussed in more detail in Section 3.4.3

[78] The Campus C build was commenced in December 2008 and completed in November 2010. The existing out-of-town Campus A was vacated between January and April 2011, and then sold to housing developers

[79] 'BREEAM' – the 'Building Research Establishment Ltd Environmental Assessment Method' (for example, see Anderson & Shiers, 2009).

environmental impacts rather than measuring sustainability as a whole. Significantly, however, it was hoped that the BREEAM assessment would gather data that could be utilised as secondary data in the FCA exercise.

It is worth providing some detail on the old and new campuses at this point to give the reader some context. Campus A was a 1950's built, red-brick, flat-roofed former technical college, set in extensive grounds containing large areas of grass and woodland. The total area of the site was 5.4 hectares. The site was situated in a suburban area of the city, away from the city centre. This meant that the campus lacked visibility (it was often referred to as 'college A' rather than as part of the University). It was also not that easily accessible using public transport.

The City Council were very keen to encourage the University into a city centre site, specifically to a site on the riverfront. The banks of the riverfront were being redeveloped, for a number of miles on each side, as part of a larger project to regenerate the city as a whole (which was an industrial city that had fallen on hard times in recent decades). Campus C was seen as providing a landmark building for the city centre. The campus would bring together the Art[80] and Business Schools of the University in one building, a partnership that it was hoped would develop entrepreneurial spirit and 'creative capital'. The new campus was boldly designed, with large, open atrium spaces, visibility throughout (achieved by significant use of glass on the exterior and for interior walls), an open library/learning space, and a ground floor exhibition space open to members of the public. Staff from the Art and Business Schools would share open plan offices that were dubbed 'a hothouse of creativity and enterprise' by senior management. Further, it was envisaged that local businesses would be drawn to use the campus given its prominent, central location.

When the case study was selected, a member of university senior management (U11 per the coding in Table 3.1) who had special responsibility for the building of the new campus was approached and asked: (a) how the university was

[80] Including film, fashion and photography departments

measuring the sustainability impacts of its new campus (including details of the BREEAM assessment); and (b) whether the university would be interested in participating in a FCA case study. With the approval of U11 a short study was then undertaken to assess the feasibility of conducting a FCA assessment of the Campus C development. This included a review of the environmental study commissioned by the university at the planning stage of the new campus development, and initial desk research to assess the information that might be available from the BREEAM assessment. Having concluded that an application of FCA was *likely* to be feasible, a research proposal document was written and sent to U11 on 29th November 2007. This document: outlined the scope of the potential FCA application; summarised FCA, its application in previous studies and the FCA methodologies developed; listed rationales for use of the new campus as a FCA case study; listed benefits to the university of participating in the study; assessed the risk of the project; discussed a project timetable, resource requirements and confidentiality arrangements (and included an ethics form to cover initial exploratory interviews); and presented the FCA SAM model as a detailed case study (highlighting the original BP SAM, the ‘construction’ SAM, and a revised construction SAM as applied to Campus C[81]).

A further meeting was held with U11 on 25th Feb 2008 to continue to discuss the feasibility of the proposal. A slightly amended proposal document was presented and discussed at this meeting. The meeting covered the concept of FCA and prior applications, data requirements and sources, and a proposed project timetable. Following this meeting, contact was made with sustainability consultants undertaking the BREEAM assessment to clarify what data would be available for use in a FCA exercise. At a meeting with a representative of the consultants on 18th April 2008, the proposal document noted above was presented and detailed expected data requirements were discussed. It was agreed at this meeting that the consultants would be able to provide a copy of the BREEAM assessment, and that this would provide data on impacts such as projected campus energy usage and construction material components. It was

[81] See chapter 5, Section 5.1 for analysis of development of the FCA model for the campus, and a justification for using the construction SAM as a starting point for model building.

concluded at this point that a FCA application *was* feasible, and U11 signed an institutional consent form to allow the proposal to proceed on 16th June 2008.

Construction of 'learning for action' cycles (as detailed below) then began with a series of semi-structured interviews with key university staff and management during the summer of 2008.

3.4.3 An employee-led enquiry

The case study raised issues for the author given that he was employed by University X. As he would act as the instigator of the action research intervention he would be interacting with and challenging senior management of the university. At the start of the study the author was a Senior Lecturer in the Business School. A finding out process required interviews to be conducted with a hierarchical chain involving grades of staff from Vice Chancellor to Deans of School; after this there would be ongoing contact in a project group with staff from Deputy Vice Chancellor downwards. The author was relatively distant from the majority of these staff in terms of his day-to-day role, with the exception of the Dean of a School and a Head of Department. It was anticipated that this separation/distancing (both in terms of rank and day-to-day roles) would have three main effects, both positive and negative, during the research. Firstly, it might allow some impartiality in the analyses to be conducted and communications made – more than might be the case if the author was interacting with peers with whom he worked on a day-to-day basis. Secondly, it might afford each stage an extra degree of discipline, structure, rigour and formality, as the author would not want senior management to witness any sub-standard work from him at any point. (However, it should be noted that the author's professionalism should have ensured rigour in any case.) Finally, the author might be not confident enough to challenge participants at various stages in the process given their seniority and might be tempted to 'water down' any negative comments reported, for example due to the fear that it might affect future promotion prospects. An external instigator of change might feel bolder, be able to push people further despite their rank and be able to communicate issues in a less biased way. It was however felt that the author's previous career experience as an external auditor and training as a Chartered Accountant would mitigate these risks.

Issues arising from the employee-led enquiry are dealt with in chapters 5-7.

3.5 The Soft Systems Methodology 'learning for action' ('SSM LFA') cycles used

This Section illustrates in detail how Soft Systems Methodology was adapted for and applied to University X. The original Soft Systems Methodology learning for action cycle developed by Checkland & Poulter (as illustrated in Figure 3.1) was firstly annotated with the particular characteristics of the University X case study – see Figure 3.2a for the initial hand-drawn version (as encouraged by SSM) and Figure 3.2b for the typed version. It was then summarized to illustrate the cyclical nature of the process (Figure 3.3). The building of models of purposeful activity, a key element of Checkland & Poulter's original cycle, was seen as the centrepiece of the approach in order to build variants of an FCA model in a dialogic manner. It was envisaged that a project group would be formed, who would meet and build individual FCA models using the SSM 'root definition' 'PQR' formula[82]. These models would surface individual worldviews regarding sustainability and the measurement of it and would allow discussions around the problematical situation. The discussions would lead to a common FCA model that accommodated the worldviews of the group. Root definitions would also be used to track movements in the FCA model built across a number of cycles, and to set a baseline of sustainability discourse at University X prior to the intervention (which the post-intervention situation could be compared against).

[82] 'Root definitions' are ways to describe models of purposeful activity using a PQR formula – 'do P, by Q, in order to achieve R'. In the case of University X, the root definition would be: measure sustainability (P) by performing a FCA analysis of (??) categories and impacts (Q) in order to provide better information that might alter behaviour/decisions (R). The key concentration would be on expanding and debating different versions of Q.

In addition to adopting Checkland & Poulter's cycle structure, the methodology used also explicitly included two rounds of semi-structured interviews conducted at the beginning of the first and at the end of the second LFA cycle. These were conducted for a number of purposes, including the initial gathering of information in a 'finding out' process prescribed by Checkland and Poulter as discussed below. Ultimately, however, they aimed to capture management attitudes towards and perceptions of sustainability and FCA before the first cycle (i.e., pre-intervention), and to determine, after the completion of the second cycle (i.e., post-intervention), whether an FCA engagement conducted in an explicitly dialogic manner had led to organisational change. The interviews were hence designed as a key data gathering technique in order to satisfy the third thesis objective. The techniques used and questions asked are detailed in Sections 3.5.3 and 3.5.5 below, and the interview results obtained are analysed in chapters 4 and 6.

The overall methodological approach allowed the thesis research objectives born in chapter 2 to be satisfied. The objectives were linked to various stages in Figure 3.2b. Objectives (a) and (b) were met by performance of stages 4 – 7 in the cycle, which led to the production and use of a new FCA model, with detailed quantitative outputs in the form of FCA calculations. Objective (c) was met by analyzing all evidence gathered prior to, during and after two full cycles had been completed (including analysis of the semi-structured interviews).

3.5.1 First cycle: pre-cycle work – initial data gathering

The perceived problematical situation in the case study (STAGE 1 in the Figure 3.2b cycle) was initially defined as: "University X is not holistically measuring and monetizing its sustainability impacts in relation to new campus developments". As noted earlier, this prognosis was reached by the author based on knowledge gathered during initial discussions with university management and consultants, and a desk review of various documents. While the new campus assessment process had involved a BREEAM assessment, a holistic assessment of

<u>Figure 3.2a</u> – An amended SSM 'learning for action' cycle for 'University X' (hand-drawn).

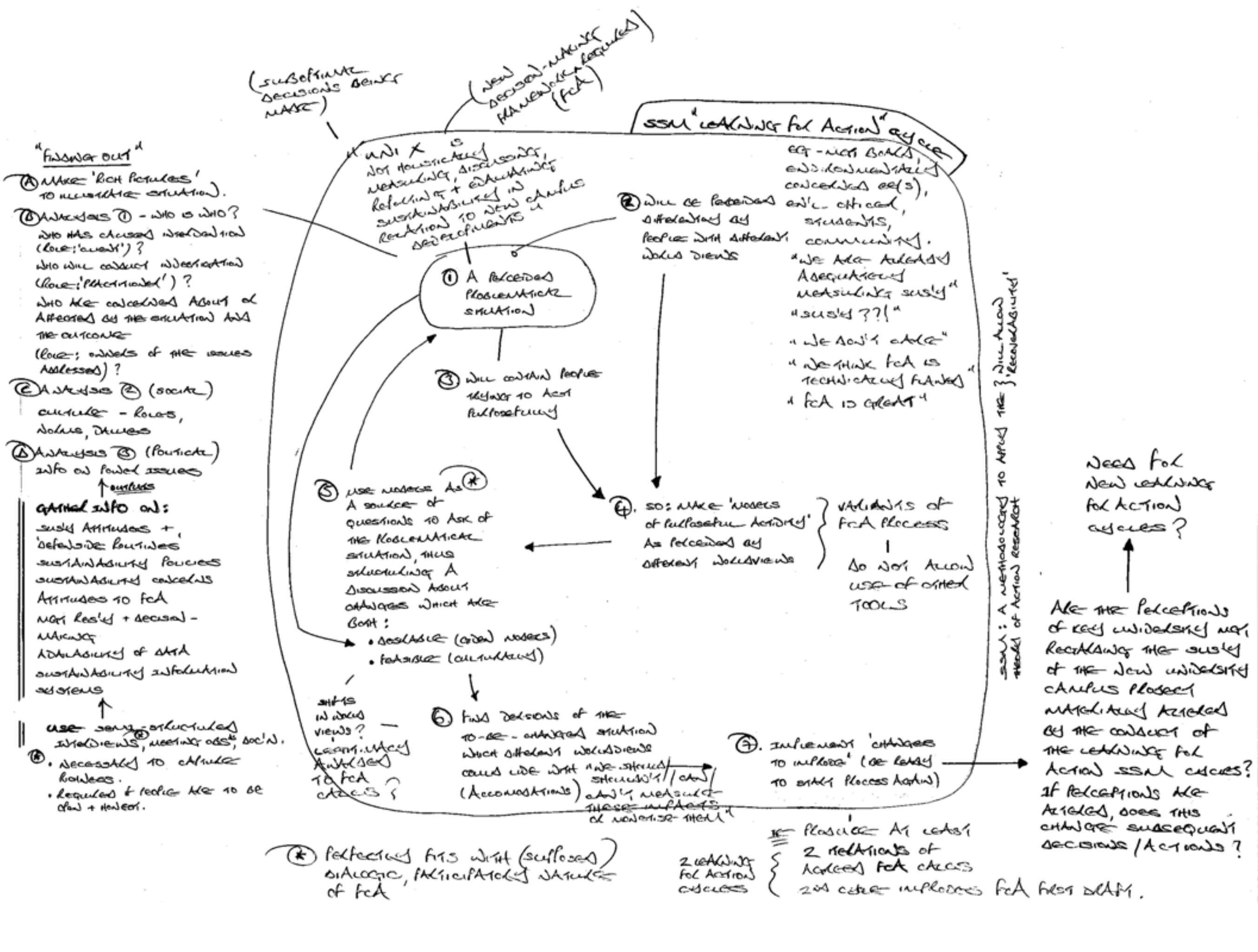


Figure 3.2b – An amended SSM 'learning for action' cycle for 'University X' (typed).

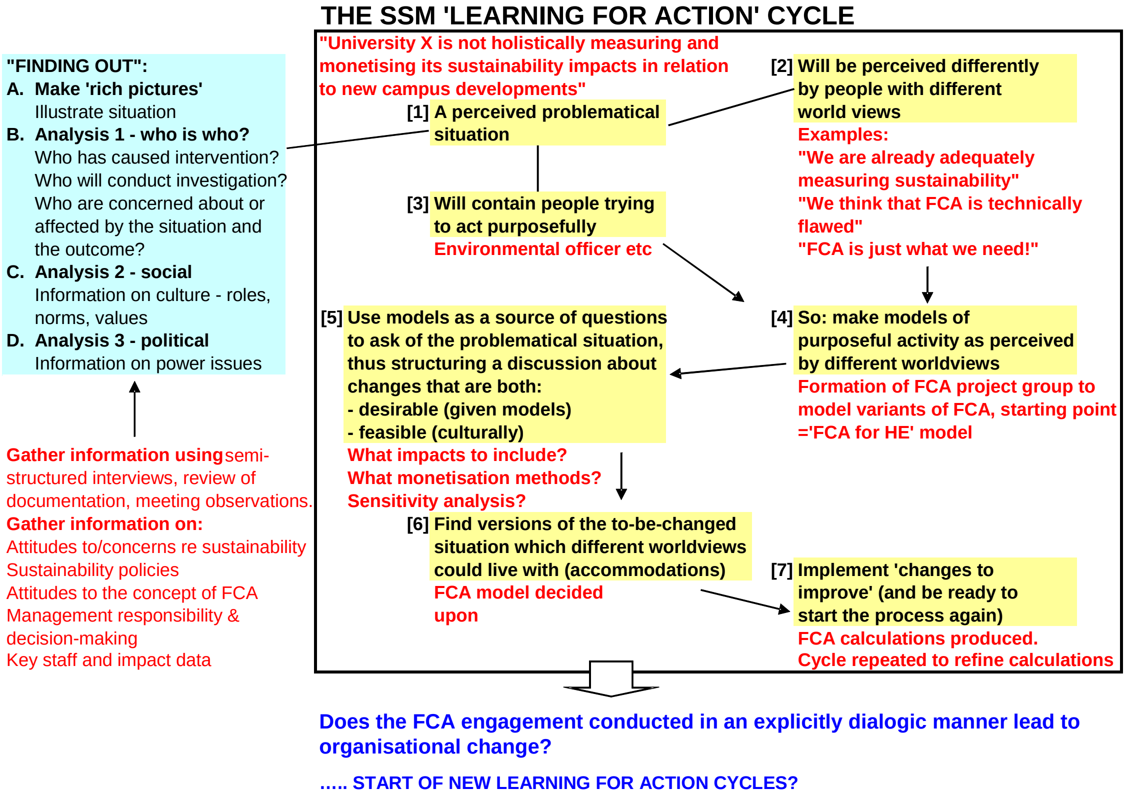
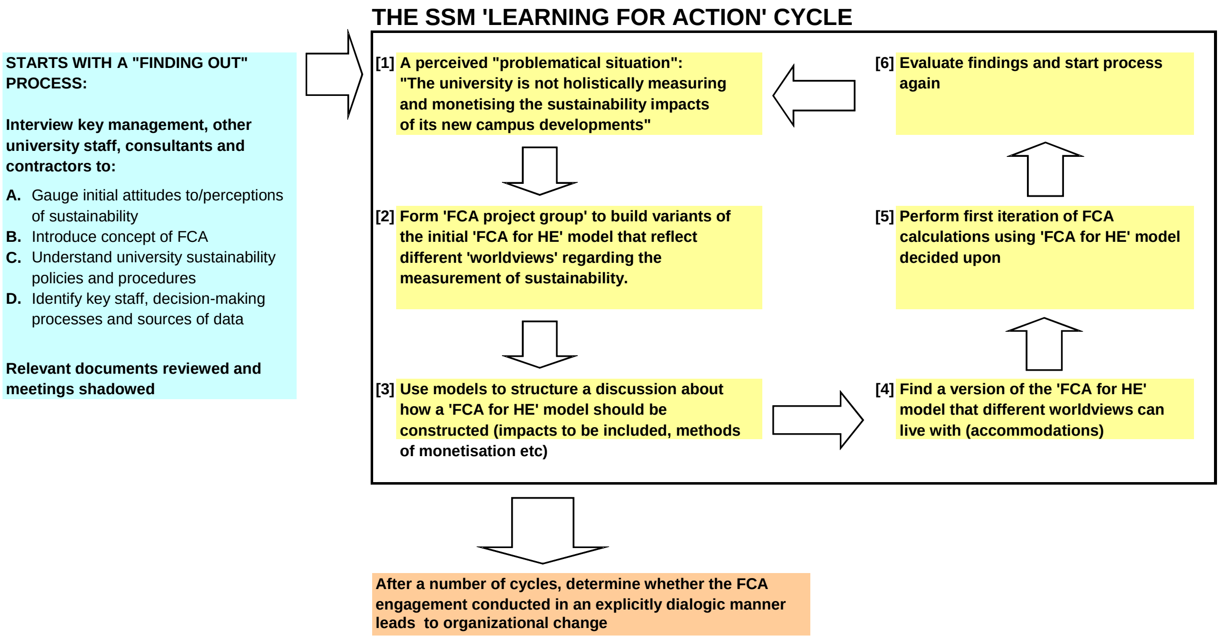


Figure 3.3 – University X 'learning for action' cycle (simplified).



sustainability had not been made. Further, it appeared that the university had a fairly rudimentary environmental policy and strategy, but no sustainability policy or strategy.

3.5.2 First cycle: an overview of the 'finding out' process – interviews, observation, and review of documents

The 'finding out' process aimed to verify that the problematical situation was accurate, and also attempted to measure a 'baseline' regarding management activities and attitudes towards (and perceptions of) sustainability prior to the intervention of the action research facilitator (i.e., the author). It also sought to gather any information that would assist with future FCA calculations (such as sources of impact data). As noted above, the 'finding out' process thus involved the gathering of data by the author using a first round of semi-structured interviews with key management of University X, plus other university staff either involved in the new campus project or with an interest in sustainability. Data was gathered on management attitudes towards, and perceptions of, sustainability (both generically, applied to the HE sector, and applied to the current operations of the university and the new campus development), university management structures and decision-making processes, current monitoring and reporting of environmental (and wider sustainability) information, current perceptions of sustainability performance and perceived gaps in current knowledge. The interviews were supplanted by observations made at meetings to discuss the new campus, and a review of relevant further documentation (both relating to existing university environmental and sustainability practices – such as documented policies and procedures – and the new campus project specifically). The interview process also allowed the perceived problematical situation to be discussed and agreed with management, FCA to be introduced as a solution (and initial feedback on it to be obtained), people to be co-opted onto the project group noted above to develop an appropriate FCA model, and the initial model developed by the author to be critiqued.[83]

Further detail on the interview process is provided in Section 3.5.3 below.

Differing worldviews (Figure 3.2b STAGE 2) were captured by the 'finding out' interview process (although the worldviews that appear on Figure 3.2b were written before the interviews were undertaken and have been inserted as an illustration). People that were trying to act purposefully (Figure 3.2b STAGE 3) in this situation included the campus development project committee, the environmental officer of the university, various members of the management board, numerous other university employees, and sustainability consultants and architects.

3.5.3 The pre-cycle exploratory 'finding out' interviews - detail

Table 3.1 below details the role of interviewees at the university, the dates that they were interviewed and whether or not they were co-opted onto the project group. A small number of initial interviews were booked with key management and staff. Interviewees then identified other managers and staff who had an interest in or a role involving sustainability, and these were approached for interview (see interviewees marked '*' in the table below). A more detailed table is provided in chapter 4 to accompany the interview analysis. The chapter 4 table also includes links that people had with sustainability and/or the Campus C project.

Interviewees were initially contacted by e-mail to request an interview. The e-mail also introduced the research project and had attached to it a further updated version of the proposal document noted in Section 3.4.2. This version included the initial 'FCA for HE' model (for a copy of this see chapter 5, Figure 5.1c), and it

[83] The construction SAM altered by this author for the initial proposal document was amended further prior to the interview stage to form a 'FCA for HE' model. **The model development is discussed in detail in chapter 5.**

also explained the ‘SSM LFA’ model development methodology to the interviewees.

At the start of each interview, each interviewee was presented with an agenda as reproduced in Table 3.2 below that sought to cover background information on the project (an outline of the thesis and the purpose of the interview), interview admin (permission to record the interviews and confidentiality agreements), and the detailed structure of the interview (questions on sustainability/sustainable development and questions on accounting and sustainability). The author then used a question prompt sheet (only available to be seen by the author) so that roughly the same questions were asked of all interviewees for consistency. The author did however take account of answers already given by each interviewee when interviewing, and altered subsequent questions asked if it was felt that the information had already been gathered earlier in the interview or if it was felt that a particular question would not be applicable to a particular interviewee. Interviewees were also given freedom to expand on points made and this was encouraged with additional questions. As noted above, in addition to gathering information to set a data baseline in order to allow comparison with the post-intervention situation (which required certain standard questions to be asked of all interviewees), the interviews were also undertaken to gather information on both the accuracy of the problematical situation and to identify sources of information for future FCA calculations. Facts provided in earlier interviews and gathered by the author in initial desk reviews were corroborated. Further, the interviews were seen as being part of the dialogic process and therefore two-way discussion that might change worldviews and improve the understanding of both interviewee and interviewer was also encouraged. The interviews therefore included sections where interviewees were given mini-tutorials on FCA (they were talked through a factsheet) and on the ‘learning for action’ cycle methodology, and they were introduced to and asked to comment on the author’s initial ‘FCA for HE’ model.

Table 3.1 – Interview and project group schedule

Code	Interviewee	Date of interview	Level of confidentiality requested	Agreed to join FCA project group?	Attended project gp meetings?	
					1st	2nd
U1	University Senior Management	03/08/2008	D	No		
U2	University Senior Management	06/08/2008	D	No		
U3	University Environmental Officer	08/08/2008	A	Yes	Yes	Yes
U4	Director*	28/08/2008	D	Yes	Yes	Yes
U5	University Senior Management*	29/08/2008	D	Yes	No	No
U6	Dean of School*	19/09/2008	A	Yes	No	No
U7	Director*	23/09/2008	A	Yes	Yes	No
U8	Dean of School	30/09/2008	D	Yes	Yes	No
U9	Director	03/10/2008	A	Yes	Yes	Yes
U10	Director*	06/10/2008	D	Yes	Yes	No
U11	University Senior Management	31/10/2008	A	Yes	Yes	No
U12	Head of Subject*	Interviewed but electronic transcript lost		Yes	Yes	Yes
U13	Head of Department	N/a as joined ins'n and project group at later date			No	Yes
	University Senior Management	Did not respond to invite				
	Dean of School	Declined invite				

Key

A: I agree for my name and discussion answers to be quoted in the thesis published by the author
B: I agree for my answers to be quoted but I wish to remain anonymous
C: I wish for all answers given to be treated confidentially and not to be quoted directly in the thesis
D: I request to see a copy of all interview transcript(s), in order to agree elements in answers that should remain confidential and/or anonymous. I will inform the author in writing of these elements and will expect a confirmation of these matters from him.[84]

[84] All of these interviewees were sent copies of anonymised quotes attributable to them to ensure that they were happy for them to appear in the thesis.

The question prompt sheet is reproduced in Appendix A, Table A1. It included expectations under some questions of the responses that interviewees might give (derived from the literature), and/or information that the author had gleaned from desk reviews that required corroborating. The expectations were included so that interviewees could be questioned further if they did not produce anticipated answers. For a copy of the FCA factsheet see Table 3.3 below. The initial 'FCA for HE' model presented to interviewees can be viewed in chapter 5, Figure 5.1b. A clean prompt sheet was printed off for each interviewee, and the author made notes on this as each interview progressed in addition to electronically recording each interview.

The interview analysis is contained in chapter 4. The interviews were analysed using three frameworks: Laughlin's organisational change framework; the SSM 'finding out' analyses ('who is who'; 'social'; and 'political'); and institutional theory. Root definitions were also built to provide a baseline picture of sustainability discourse. The overall framework for analysis was therefore very robust.

The SSM 'finding out' analyses and root definitions were seen as being complementary and supplementary to Laughlin's organisational change framework, and hence a good fit within the overall meta-framework used for analysis. SSM's 'who is who' analysis and the 'role' element of the SSM social analysis provided a starting point to and backdrop for the analysis of the organisation. The analysis made clear who had caused the intervention, who would conduct the investigation, what the roles of participants were, and who was concerned about or affected by the situation or outcome (linked to roles). The remainder of the SSM 'social' analysis (norms and values) dovetailed with the interpretive schema element of Laughlin's framework. The building of root definitions to describe sustainability discourse linked (and provided richness) to the analysis of the current design archetype of the University. SSM's political analysis was adapted to this particular case. Rather than examining commodities of power per se, it instead examined the issues associated with an employee-led

<u>Table 3.2</u> – Interview agenda

1. **Introduction**

    - Thesis outline – development of full cost accounting ('FCA') and the Campus C FCA project
    - Purpose of interview

2. **Interview admin**

    - Permission to electronically record interview
    - Confidentiality agreements
        - Institution level (already signed)
        - Individual interviewee & project group level (to be signed)
        - BRASS data management and consent form[85]

3. **Detailed interview structure**

    <u>PART 1</u> – questions on sustainability and sustainable development (SD):

    A. Attitudes towards, and perceptions of, the generic concepts of sustainability & SD
    B. Sustainability and SD in the HE sector
    C. University X – current sustainability position
    D. Sustainability information systems

    <u>PART 2</u> – questions on accounting and sustainability (will include details of FCA and the 'FCA for HE' project)

[85] The author commenced this thesis at Cardiff Business School (before later transferring to Kings College, London), as a student of the Business Relationships, Accountability, Sustainability and Society ('BRASS') research centre. Therefore, both BRASS and Cardiff Business School confidentiality and data consent forms were used.

<u>Table 3.3</u> – FCA factsheet

1. **What is FCA, and why is it needed?**

    - **Full Cost Accounting ('FCA'):** methodologies and models developed to measure in **common monetary terms** the **full economic, social and environmental impacts** of an organisation's activities

    - **Why do this?**
        - Full impacts ('externalities') often not considered, accounted for or reported
        - Traditional accounting outdated and deficient
        - Market prices are incorrect
        - Implication: decisions made by organisations and individual consumers that are not sustainable for the planet and its life-forms
        - FCA a way of correcting market prices and hence altering production and consumption decisions

    - **Prices are not corrected by governmental policy instruments**

    - **The 'information gap' has not been filled by voluntary, mainly non-financial 'sustainability' reporting**

2. **What are the stages in FCA?**

    - Definition of the 'cost objective' (i.e. what area of the organisation will be looked at?)

    - Identification of internal costs and associated benefits

    - Identification and monetisation of external impacts:
        - Specification of scope and limits of the analysis (setting of boundaries)
        - Identification and measurement of external impacts
        - Monetisation of external impacts (avoidance/restoration costs? Damage costs?)
        - Linkage of monetised figures to the income statement/balance sheet, and/or other representations

3. **How has it been applied to date?**

    - **Forum for the Future's Sustainability Accounting Methodology:**

        - Impacts for accounting period monetised using avoidance/restoration costs, and deducted from accounting profit

    - **BP's Sustainability Assessment Model ('SAM'):**

        - Project impacts over whole project life cycle monetised using damage costs; graph and percentage sustainability indicator constructed

4. Arguments against FCA?

- The critique of the ‘deep greens’
- Technical/knowledge deficiencies (but note Antheaume, 2007)
- Multiple data sets and conclusions, allocation of responsibility
- Issues re cost, competitive advantage, organisational viability and litigation
- Policy environment generally not supportive
- Accounting profession driven by client needs and conservative (but note Prince of Wales Accounting For Sustainability project, ongoing)

5. Arguments for FCA?

- Working to alter existing practices the only option
- Attempting to roughly correct a flawed system better than doing nothing
- Seeks to correct traditional accounting; other tools utilised to measure sustainability do not correct prices
- Information produced is in the ‘language of business’ - understandable to managers
- Assists in strategic planning (hidden costs of ‘business as usual’ mode of operation revealed, comparison of alternatives)
- Demonstrates ‘green credentials’ of particular projects, products or services
- **Educational importance of evaluative process (participatory, dialogic) versus information produced**
- Benefits for University X:
  - Involvement in a cutting-edge field of research
  - A chance to showcase the University’s green credentials
  - Opportunities to drive regional (and University/HE sector) sustainability through dissemination of best practice
  - FCA educational at strategic and operational levels
  - FCA a driver of continuous improvement, and future cost savings

enquiry. The SSM 'CATWOE' mnemonic was not used for analysis as its components had already been picked up in the root definitions and 'finding out' analyses. Interview quotes have been included in chapter 4 when applying the various lenses of analysis to add richness to the analysis and to illustrate the attitudes and perceptions of participants. This style of analysis was influenced by and based on the work of Solomon (2009a and 2009b) cited in Section 3.1 above.

3.5.4 First cycle: formation and operation of project group

A project group chaired by the author was formed from volunteers who participated in the initial interviews to construct models of purposeful activity based on different worldviews (Figure 3.2b STAGE 4). At the first formal project group meeting, it was planned that members of the group would be asked to review and critique a revised 'FCA for HE' model (which had been altered following their feedback in the initial interviews), and to construct their own models. Participants would be asked to review the impacts identified by the author in detail, identify additional impacts, consider whether it was feasible and/or appropriate to monetise the impacts, and consider the possible methods of monetisation available. A further revised 'FCA for HE' model that accommodated worldviews (Figure 3.2b STAGE 6) would then be developed following discussions within the group (Figure 3.2b STAGE 5).

The first project group meeting was held at University X, in a 'neutral' classroom booked by the author set up in boardroom format, in January 2009. To open the meeting, the participants were given a presentation by the author that:

(a) recapped on the concept of (and critiqued) FCA, its main stages, and the action research (and soft systems methodology) being utilized;
(b) talked through the initial 'FCA for HE' model discussed at the interviews, plus amendments made reflecting comments received during the interview process; and

(c) critiqued alternative sustainability measurement approaches, including Forum's Sustainability Accounting and Lozano's 'GRI for Universities'.

It should be noted that the presentation also included a tutorial on tools for model building as prescribed by Checkland and Poulter. Namely, it introduced the concept of 'Root Definitions'. Table 3.4 below summarises the bullet points from the tutorial slides.

It was then planned that the group would build alternative *individual* models before reconvening to discuss them, and they were prompted to do this. However, the group began by engaging in an open discussion debating various issues surrounding the 'FCA for HE' model that had been presented, and this wholly took up the allotted time for the meeting. The group participants did not build their own models, although they were asked a second time during the meeting whether they wanted to continue commenting on the model presented or restart with blank pieces of paper. In order to round up the discussion and to reach a conclusion on the way forward, the author therefore asked individual participants to identify the five most important impacts that they would wish to see monetised, and encouraged the group to reach a consensus on boundaries and the method of monetisation. (The overall conclusions reached by the project group are discussed and analysed in chapter 5, Section 5.1.3.) The group then agreed to let the author begin to calculate FCA numbers, and to reconvene once a first draft of the calculations were available. Following the meeting, the author circulated the main conclusions drawn to the group via e-mail, and an action plan to measure and monetise impacts. Given that the group had also struggled to envisage the outputs of the whole project during the meeting, an illustrative output graph (that also highlighted the impacts deemed most important by the participants during the meeting) was also circulated (for copies of these items see chapter 5 Section 5.1).

Table 3.4 – Model-building tools tutorial (slide presentation extracts)

- **SSM - build models of purposeful activity and describe in 'root definitions'**
- **Consider 'CATWOE':**
  C = customers (beneficiaries of T)
  A = actors (those who will do T)
  T = transformation process (conversion of input to output)
  W = worldview which makes T meaningful
  O = owners (those who could stop T)
  E = environmental constraints (elements outside the system that are taken as given)
- **In this case:**
  - Input = university in current state
  - Output = university in transformed state, i.e. better informed about sustainability
- **Also consider 'PQR':**
  - **P** tells us what to do
  - **Q** tells us how to do it
  - **R** tells us why we are doing it
- **In this case:**
  - Measure the sustainability of the new campus …
  - by performing a FCA analysis of [?] impacts ...
  - to provide better information that may alter perceptions/attitudes towards sustainability (and hence alter subsequent behaviour/decisions taken)
- **Also consider success of process, for example:**
  - Efficacy – will it measure sustainability?
  - Efficiency – will it use a minimum amount of resources?
  - Effectiveness – to what extent will it alter perceptions/attitudes/behaviour/decisions?

Source of frameworks: Checkland & Poulter 2006 (p. 38-48)

In conclusion, while the group did not follow the strict SSM model-building procedure[86], the session was still democratic as it was ensured that everyone contributed in approving or altering the initial model. (Indeed, participants' views on the democratic and participatory nature of the whole process was checked during the final interview process, as documented in chapter 6.)

The FCA calculations took place at STAGE 7, conducted by the author.

3.5.5 The second learning for action cycle

The first draft of the FCA calculations were discussed with the project group at a second formal project group meeting (again held at University X in a 'neutral' classroom, in November 2009). A formal report had been distributed to the members of the group prior to the meeting, in which the methodology behind the calculations was described, issues were highlighted and monetised impact figures were presented. Some members of the group gave feedback on the calculations prior to the meeting, including some who could not attend the meeting. At this second meeting, the draft calculations were gone through line-by-line, the calculations were debated, and further work to be undertaken was agreed. Given that individual model-building did not occur in the first meeting, it was not attempted in the second. In any case, at this stage as the model had been used to produce calculations, it seemed more appropriate to appraise the model headings and the calculations line-by-line with the participants. The outputs of the second meeting and the effects they had on the model and calculations are analysed in chapter 5, Section 5.1.5).

The second cycle was concluded when a final report was issued to the project group, containing the second, final draft of the calculations. To complete the process, a second round of semi-structured interviews were conducted with the project group participants. These are analysed in chapter 6. The interview style adopted was very much the same as that described above for the first round of

[86] Power issues (i.e., the seniority of staff compared to the author) may have also led to the author being more wary of challenging project group participants to build their own models during the meeting.

‘finding out’ interviews. A question prompt sheet was again used, and this is reproduced in Appendix A, Table A2. The purpose of each interview was to obtain participant views on the development process for the ‘FCA for HE’ model, the final model developed and the results obtained using the model, and to determine whether: the whole process had been dialogic; substantive organisational change had resulted; and (c) whether institutional barriers had affected the application. The three lenses introduced in chapter 2 were used to conduct the analysis, and so a robust framework was used as with the chapter 4 interviews.

3.5.6 Summary of process

Figure 5.1a in chapter 5 illustrates how the SSM LFA model development process led to revisions of the ‘FCA for HE’ model and the calculations. Chapter 5 evaluates both the development of the ‘FCA for HE’ model (Section 5.1) and the first and second drafts of calculations performed (Section 5.2 onwards). Root definitions are used as part of the analysis.

3.6 Success of thesis methodology

The success of the thesis methodology has been evaluated in chapter 5, Sections 5.1.6 and 5.9 and chapter 7, by assessing whether empirical outputs from the thesis have satisfied the thesis research objectives and critiquing in hindsight the research design.

CHAPTER 4: ANALYSIS OF EXPLORATORY 'FINDING OUT' INTERVIEWS

4.1 Introduction

As noted in chapter 3 (Section 3.5.3), pre-cycle exploratory 'finding out' interviews were conducted and these are analysed in this chapter. The analysis is undertaken through three lenses: Laughlin's organisational change framework (interpretive schema, design archetype and sub-systems), in Section 4.2; the SSM 'finding out' analyses (who is who; social; political), immediately below and in Section 4.4; and institutional theory (Section 4.3).

Table 4.1 provides details on the interviewees (both people invited and people interviewed), and it is worth noting at this stage some details on 'who is who' and 'roles' (the first SSM 'finding out' analysis and part of the second).

The intervention was caused by the author perceiving that sustainability measurement was deficient at University X. The investigation was to be conducted jointly by the author and the project group, although it was recognised at the research design stage that it was highly likely that the calculations would be conducted by the author after authorisation by the project group. Draft calculations would then be brought back to the project group and alterations made to both the model and subsequent impact and monetisation measurements.

Table 4.1 highlights the roles and seniority of staff interviewed (to a level ensuring anonymity) and the linkage of their roles to sustainability. One can sort staff into three types: those with a specific role linked to sustainability (such as the University Environmental Officer and a Dean of School charged with overseeing a sustainability audit of the curriculum; five staff in total); those whose operational roles involve making decisions that will impact on sustainability (such as the Director of Estates and the senior manager with special responsibility for

<u>Table 4.1</u> – details of University employees invited to interview

Code	Title	Role specifically linked to sustainability?	Directly involved in the Campus C project?	Date of interview	Co-opted onto FCA project group?
U1	University Senior Management	No, although attended HEA ESDGC conference Spring 2008 (2)	Yes – member of key management group	03/08/2008	No
U2	University Senior Management	No (2)	Yes – as member of key management group	06/08/2008	No
U3	University Environmental Officer	Yes (1)	Only partially per interview	08/08/2008	Yes
U4	Director*	Partially – involved in ESDGC at institution level (1)	No	28/08/2008	Yes
U5	University Senior Management*	Partially – involved in ESDGC at institution level, including set-up of sustainable technology centre # (1)	Yes – as member of key management group	29/08/2008	Yes
U6	Dean of School*	Partially – involved in ESDGC at institution level, including curriculum audit # (1)	No	19/09/2008	Yes
U7	Director*	Partially – involved in ESDGC at institution level, previous research in area # (1)	No	23/09/2008	Yes
U8	Dean of School	To extent impacts on Campus C project (2)	Yes – School housed in new campus	30/09/2008	Yes
U9	Director	To extent impacts on Estates management & Campus C project (2)	Yes	03/10/2008	Yes
U10	Director*	No (2)	No	06/10/2008	Yes
U11	University Senior Management	To extent impacts on Campus C project (2)	Yes – special responsibility for delivery of new campus project	31/10/2008	Yes
U12	Head of Subject*	Research interest via religion and ethics (3)	No	A – see below	Yes
U13	Head of Department	Research interest in sustainability (3)	No	B – see below	Yes
	Dean of School	No	Yes – School housed in new campus	C – see below	No
	University Senior Management	No	Yes – as member of key mgt group	D – see below	No

<u>Table 4.1b – Key</u>
'ESDGC' refers to 'Education for Sustainable Development and Global Citizenship'
\# Also attended Higher Education Academy ('HEA') ESDGC conference Spring 2008
* Identified following initial interviews
A: U12 was interviewed, but the electronic transcript was lost
B: U13 only joined the project group at the time of its second meeting and so was not interviewed as part of the 'finding out' process
C: Invited to interview but declined, stating that he did not have the knowledge to contribute

D: Did not respond to request for interview. He did however attend a CPD lecture that the author gave on Environmental Accounting in April 2010, and noted that he was aware of the project and had been discussing it with another member of University Senior Management

(1) Deemed to have a specific role with regard to sustainability

(2) Operational role impacts on sustainability by its very nature

(3) Research interests in area

delivery of the new campus project; six staff in total); and those with research interests in the area (two staff).

The sections below highlight that virtually all of the interviewees and project group members were concerned about sustainability performance and measurement (in the sense of wanting to improve performance and obtain better information on performance). Indeed, a number of interviewees noted the urgency of dealing with climate change and other environmental issues. The people most concerned about and sceptical of the outputs from the project (the FCA calculations) appeared to be the managers with direct responsibility for the Campus C project. One could speculate that this might have been because there was a risk that the project might be shown to be less sustainable than envisaged.

4.2 Current organisational characteristics

4.2.1 Strategy of University X

It was confirmed with the University Environmental Officer that University X did not have an overarching sustainability strategy or a system for setting holistic sustainability targets and measuring/reporting the achievement of them. It only had an environmental strategy and targets. (Prior to the interviews, the interviewer had downloaded the policy and strategy from the University website. External reporting undertaken by the University had also been reviewed[87].) The original 5-year environmental strategy introduced had come to an end in 2007/08 and had been replaced with a 2008-2013 strategy that had been taken to Management Board for approval (although the most senior University manager interviewed was not aware of this).

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87 In the 2006/07 Annual Report of University X, a section entitled 'Building For The Future' discussed a facility to convert waste vegetable oil into biodiesel, the constant addition of environmentally friendly measures (such as passive infra-red lighting sensors and urinal flush controls), and the eco-friendly design features of a new campus building (such as solar shades on the south-facing side, rainwater collection and a state-of-the-art efficient heating system). It also described the recycling record (without comparatives). Other sections of the report highlighted the role of University X as a community university, and discussed equality and diversity.

The lack of a sustainability strategy and indicators/measurement of sustainability was corroborated with other interviewees, and it was also consistent with the author's experience as an employee of the university. In particular, one interviewee (U6) noted that as the environmental strategy was currently located with the Estates department, that did not allow it to deal with softer, social issues (and hence by implication sustainability in a holistic sense). Only one interviewee felt that the University did have a formal sustainability strategy, but this was only in the context of the Campus C project.[88]

Interviewees were asked whether they thought that the environmental strategy had been successful. While it was noted that the strategy had achieved some success including physical improvements and changes in attitudes, it was noted that it was a limited strategy. For example:

> *"Well, yeah, I think in its own **limited terms** it has been [successful], yes, I mean I think they have managed to implement a number of the measures that they set out." (U1)*

> *"I **wouldn't say we've been particularly successful** but we've certainly taken this on. **You can point to areas where we have made progress**." (U11)*

> *"I think it was very **successful in starting the ball rolling, getting things on the agenda**. I think it was …. made a good start, started monitoring, started, you know, up until the strategy was written I don't think that they had a clue what energy use for the site was. Waste management I don't think was in place, weren't recycling anything. So I think, it got the ball rolling, **raised awareness of our impacts**, we started to look at that." (U3)*

> *"I think its raised awareness and **changed practices in some areas**.....So I think it's had a positive impact on the culture of the institution." (U4)*

[88] This could be interpreted as evidence that the BREEAM process (and Excellent rating) might have given a misleading impression that the sustainability of the new campus was being measured.

“We can maybe do more with hearts and minds....There has been a difference made with physical environmental improvements, but also a ***difference in attitudes amongst management and people in general****.”* (U6)

4.2.2 Knowledge of sustainability

4.2.2.1 Knowledge and understanding of individuals

Broadly, interviewees demonstrated at least some understanding of sustainability as evidenced by their responses throughout their interviews, which was to be expected given the specific links/experience that many of them had with sustainability in some form in their current or previous roles (per analysis of Table 4.1 above). However, in some cases views expressed were narrow. When asked how they would define sustainability and sustainable development at the start of the interview, only three interviewees quoted the Brundtland definition of sustainable development and so highlighted inter-generational equity (U3, U6, U7). All interviewees demonstrated an awareness of the environmental strand of sustainability, but only five out of eleven interviewees spoke explicitly about the social strand unprompted and seven out of eleven highlighted economic/financial sustainability. Five interviewees explicitly considered sustainability to be about global issues, whereas three focused on the institution in the first instance. One interviewee appeared to exhibit a bias towards financial sustainability above other strands. Four interviewees also noted that there are difficulties in determining what sustainability and sustainable development are, and two noted that people often have misperceptions about what sustainability means (or focus on one area such as the environment). Further, when interviewees were asked whether their own worldview of sustainability differed from that held by others, two commented that there were lots of competing/different-held views on sustainability, and two noted that while people may have certain ideas/beliefs on sustainability, they do not always put this into practice. No-one commented that they felt out of step with a mainstream view of sustainability.

Only one interviewee expressed sceptical views on sustainability (appearing to dismiss it as a fad) and global warming, as part of a wider answer on whether it was possible to have a wholly sustainable university.

> *"**….do we understand the ramifications of sustainability anyway? There's a cynic in me that says that sustainability is the local buzzword** … Biofuels – initially we thought that they were sustainable but they are probably not. One of my first questions would be: is it really sustainable? How do we prove it? Have we thought about all the ramifications of the decision? I'm not 100% convinced we have. I say that from someone who's a member of the RSPB and WWF. **To me to be quite cynical the case of global warming is not quite proven. I'm sure that man has got an influence on it, but by how much I'm not sure.** I'm one of those cynical brigade that says we probably have got something to do with it but to what extent I'm not sure."* (U9)

The same interviewee disagreed with government intervention to set green taxes in a later discussion.

> *"I wouldn't agree with that. I'm a free market economist. I don't believe in government interference at that level. I totally disagree."*

Other interviewees, in contrast, noted the urgency of dealing with climate change and other environmental issues at various points in their interviews:

> *"Universities have one of the most important roles, with particular regard to climate change. **Impacts are being felt now** (I'm fairly confident of this). **Given that climate change is now upon us**, education for sustainable development now really has to focus at the university level. **We're running out of time in terms of getting it into the curriculum.**"* (U7)

> *"**The population is growing at such a rate and exhausting resources**. Some say that new technologies will be answer, but we can't take that risk of*

not trying to cut back. ***We have been eliminating species, destroying habitats****." (U5)*

"...if we don't find a way of actually managing certain resources differently, we actually will be up a gum tree, because we'll be locked into particular practice that will no longer be sustainable and we'll be stuffed." (U1)

"I know the disbelievers find it hard because they think the world is going to go on forever, and there are quite a lot of them around." (U1)

Interviewees were also asked whether their views had been altered as a result of being approached for the project, as they had been sent some background information to read prior to the interview (this question was not directed to two interviewees who had given a very full answer to the definition question above due to their previous roles). Seven interviewees noted that their views had not been altered and/or had been formed prior to participating in the project. No-one stated that their views had been altered.

4.2.2.2 The wholly sustainable institution

When asked to imagine a wholly sustainable university, four interviewees stated that they could not imagine what such an institution would look like, given the current level of understanding regarding sustainability. Other interviewees offered a wide range of suggestions regarding the characteristics that such an institution might exhibit, for example: the institution would have a sustainable infrastructure and travel plans; a distance learning model would be followed; everyone would understand and buy in to a culture of sustainability; less resources would be consumed; there would be sustainable procurement; the institution would plan for the long term; campuses would be energy efficient and energy would come from renewable/sustainable sources; there would be minimisation of waste and recycling; sustainability would be embedded in all curricula; sustainability skills taught would impact on future employment; there would be a common steer at

HE level; and the institution would work in close harmony with the local community.

4.2.2.3 Knowledge of exemplars

Knowledge of exemplars in the field was low. Interviewees were also asked to identify exemplars in the sector, institutions that might be close to being ‘sustainable’. A few examples were given by some (not all) interviewees, but they tended to be the universities who had presented at a recent HEA ESDGC conference (the exception to this was a leading local university named by two interviewees that had completed an audit of the sustainability content of it’s curricula). There did not therefore appear to be widespread knowledge of exemplars.

Three interviewees felt that new builds would make institutions more sustainable, although this was seen as necessary but not sufficient for sustainability. Finally, called the claims of other institutions into question:

> *“I’m aware that various places makes claims about buildings or things that they do … but those are very hard … have they been done, what went on behind that … no, I’m not aware of or convinced of what I’ve seen that this has been done purely to these principles. [Interviewer: Lack of measurement and proof?] Yeah.”* (U4)

4.2.2.4 Current sustainability performance of University X

Interviewees were asked how sustainable they felt that the University was at present. Three themes emerged. Some interviewees had difficulty determining the level of sustainability performance of University X; some expressed optimism (a minority); and some were pessimistic regarding the level of performance.

Those who struggled to determine current performance were unsure of suitable measurement benchmarks, which corroborates the uncertainty noted above regarding a wholly sustainable institution. For example:

> *"Without ….. we've got to have a set of things to measure it against, what is the monitoring for that, I guess?"* (U3)

> *"It depends what you regard as being 100*." (U11)

Four interviewees expressed optimism about current performance or anticipated improvements. For example:

> *"On the environmental side I think we are doing more than some universities are doing, but that's no answer at all! The previous Director of Estates, it was quite high on his agenda, and it hasn't reduced with the current one.... We have serious work to do, but we're not kind of an ostrich…."* (U1)

> *"Relative to many other organisations, we are probably closer to it (sustainable state)."* (U5)

> *"In the sector, we are probably going along OK..."* (U11)

This was surprising given the lack of sustainability information systems exposed above, as it would have been difficult for interviewees to form a judgement. The lack of knowledge of sustainability exemplars in the HE sector and the difficulties in imagining a fully sustainable university would have also made answering this question difficult.

The interviewees who expressed pessimism and/or acknowledged that there was a lot of work to do noted that it would be difficult to embed sustainability and change people's attitudes, and some problems were due to a lack of a holistic view. Estate infrastructure, travel patterns and paper usage were mentioned by a number of interviewees as areas requiring attention. Examples of comments are noted below:

> *"I don't think we are very high. We are quite wasteful of paper ... We are also quite remote. People have to drive to the campuses. Campus C may improve this, but it could increase congestion in the city centre. No higher than 3 out of 10. There are little bits going on, but we've got a long way to go*." (U7)

> *"We probably have travel patterns that are not sustainable in the long term. We probably could do more with waste separation, although we do some .... if 100 is where we want to get to, maybe [we are] 25*." (U5)

> *"When I go round the University, there is still a lot we could do. In my particular areas, looking at things like estates, curriculum, there are still things we could do. In terms of the totality, the score would tend to be on low side. However, I'd be loathed to say that …. I for example throw out a lot of paper. Paper still an issue. I'm not going to put a score on it .... In terms of a totally green sustainable university, we've probably got a long way to go."* (U11)

These negative responses corresponded with the author's experience of the institution at the time. Sustainability initiatives were not particularly visible and had not been communicated to staff. Further, monitoring of environmental targets had not transferred into improved facilities in all campus buildings. For example, the campus on which the author worked, Campus A, had very few recycling points.

4.2.3 Internal drivers and inhibitors

When asked who was/who should be driving the sustainability agenda in HE, one interviewee spoke about the influence of Vice Chancellors ('VC's'):

“If you look across the [HE] sector, you’ll see that it is led by the VC’s. Some institutions have keen VCs – you will see big differences that they have made, it becomes an important part of the vision. Other VC’s are more skeptical.” (U6)

However, tellingly, at this point the VC of University X was not held up as an example of a ‘leading’ VC, and no other interviewees mentioned the VC as being in this mould. Further, when the VC was interviewed, while he was supportive of the FCA for HE project he did not volunteer to sit on the project group and did not indicate that sustainability was a priority above other areas. Therefore, one could conclude that he was not an example of an ‘evangelical’ individual as regards his beliefs towards sustainability, and was not wishing to put it at the forefront of the mission/purpose of the organisation. The most evangelical, enthusiastic individual interviewed was U6, a Dean of School charged with leading the institution’s audit of the sustainability content of curricula. U6 exhibited a clear holistic understanding of sustainability and knowledge of the (non)activities of the organisation.

The two Deputy Vice Chancellors (DVCs) interviewed were also accommodating towards the project. As noted in chapter 3, one DVC gave the initial authorisation for the project to proceed. Both were willing to be interviewed, and one DVC was willing to sit on the FCA for HE project group. Both DVCs also made positive statements about the need to act sustainably (one sat in the ‘urgent action’ camp), the need to alter the core product of the University (curriculum) to include sustainability and/or the need to measure sustainability and work towards targets.

4.2.4 External drivers and inhibitors

External drivers/inhibitors will be analysed in Section 4.3 below utilising the lense of institutional theory. However, for the purpose of reaching conclusions on metarules below, it is appropriate to discuss funding at this point. A lack of funding was noted by a number of interviewees as an inhibitor of more sustainable behaviour. (This exposed the tensions between the economic and environmental aspects of sustainability and could be perceived as a weak sustainability/business as usual viewpoint.) For example, the Environmental Officer noted that while a more sustainable building option has been appraised when replacing a roof, it has been rejected due to cost considerations. He also noted that the environmental specification required by BREEAM might have been costed out if it had not been a stipulation of grant funding. Other interviewee responses included:

> *"The biggest inhibitor is finding funds. With more funding you could do a lot more. You are always trying to find a balance. Sustainability is an important driver, but you are funding it from a pot that is capped."* (U11)

> *"There are a lot of institutions who are doing more than us, for very good reasons. We have to contribute according to our means."* (U10)

> *"From the long term it is in your financial interests to be as sustainable as you can. People's vision for how long they are building for is important. However, the problem is that funding is received year on year from HEFCW. This does not allow for long-term financial planning."* (U4)

> *"English universities have more cash, yet the Welsh are insisting on BREEAM Excellent. But they are not funding it."* (U9)

However, some interviewees did not appear to want a lack of funding to act as an excuse for not taking action. For example:

> *[Interviewer: Is funding a big block?] "There are ways forward. Often subsidies. The funding council has given us money and we have been able to make significant environmental changes. For example – we are getting a composting rocket. Energy companies these days are sponsoring energy saving schemes.*

Also teaching resources – ESDGC – have been developed for institutions. So funding is available. My view – do things that are very transparent so people are aware of it – EG our chipfat-run [bio-diesel] minibuses. It's not always about money – it's about attitude." (U6)

4.2.5 Conclusions regarding interpretive schema: beliefs/values/norms; mission/purpose; metarules

It was noted above that University X did not have a sustainability strategy or a system for setting sustainability targets and measuring the achievement of them. It only had a limited environmental strategy and targets. Knowledge of exemplars in the field was low, some interviewees could not imagine what a fully sustainable university might look like and some had difficulty imagining the level of sustainability performance of University X. However, others (including senior managers) deemed sustainability performance to be poor. The 'norms' of University X could therefore be seen to involve some attempts to consider and control a limited number of environmental impacts, but not to consider and control a much wider range of sustainability impacts. Interviewees also demonstrated a reasonable understanding of sustainability, although in some cases this was limited (there was a bias towards environmental sustainability and a small minority seemed to be biased towards financial sustainability and hence a weak sustainability/business as usual viewpoint). It could be argued that values and beliefs were generally positive with regard to sustainability and so compatible with a proposed application of FCA (this is further corroborated in Section 4.2.6 below). Further, such an application was needed; interview responses highlighted that more understanding was required of the holistic concept of sustainability in relation to the HE sector and that this served as a justification for the building and application of the 'FCA for HE' model. The generally favourable attitudes demonstrated regarding the need to be more sustainable and improve actions implied that there would be enthusiasm for and buy in to the model development process, although one participant (the climate change sceptic) might be expected to be reticent about the process given his stance on sustainability.

Given the above evidence, it can also be concluded that an explicit commitment to sustainability was not part of the mission/purpose of the University. It did not have an overarching strategy or information systems that would have given managers more clarity on current performance and the direction of travel towards a more sustainable state. The lack of an evangelical VC was noted as a possible internal inhibitor of sustainable behaviour. The University did not appear to want to become a leader in sustainability.

Further, funding was seen as the main external inhibitor. One could therefore assume that the University was constrained by the need to be financially sustainable and that this metarule would override some sustainable decisions. This implies that views of sustainability held by at least some participants were of the ‘weak’ rather than ‘strong’ kind.

4.2.6 Design archetype: decision processes; communication systems

4.2.6.1 Measurement and decision systems

As noted above University X had an environmental strategy (but no sustainability strategy), and this had led to environmental target setting, monitoring and reporting. Targets and monitoring were being employed covered key areas such as waste management/recycling, energy, transport and water. The Environmental Officer prepared a twice-yearly report comparing actual and target figures for the Finance & General Purpose Committee. Environmental matters were also reported to the Board of Governors, Directorate and Management Board. The University had taken part in a HE carbon management programme with the Carbon Trust; a programme to identify energy efficiency measures to reduce carbon footprint had been set up. An Environmental Management System (‘EMS’) was being worked on that would ultimately seek accreditation.

While interviewees generally seemed to be aware of the 'green' initiatives of the University (a number of them mentioned the recently completed campus building and the biodiesel facility at various points in their interviews), responses were mixed regarding the quality of reporting that they viewed as members of Directorate, Management Board and/or the Board of Governors and it appeared that improvements could be made in reporting, dissemination and engagement. For example:

> *"We get reasonably detailed reports at Board of Governors and Management Board. I've seen 2 in the past year.* ***Whether there are enough people around the table who are engaged ... who feel they can contribute I don't know****. [Interviewer: So maybe there is not buy-in from all sorts of areas?] Yeah. I want to explore bringing in consultants to explore this issue with leaders of the university. But this may cost too much. I think it would be useful."* (U5)[89]

> *"There is reporting to Management Board, the broadest committee we have. Also to Governors and Directorate.* ***The position taken by governors and directorate? Not as visible as it could be****. I think there are good things being done. And some things are being reported that are being done. But* ***there is also a fair bit that is not clear****. I'm not saying it is not happening ... I might know because I take an interest ... but whether other people know. Part of the thing is communicating the vision and ethos – perhaps we could be a bit better."* (U6)

> *"I'm aware of it because of presentations at Management Board. But no more aware than other items presented eg freedom of information. In terms of progress – I don't know. I don't think we have been presented with that. The last presentation we had would have been at least a year ago. So* ***it's not something that comes up on regular basis. It's not a regular monitoring item for Management Board****."* (U8)

[89] Note – certain key elements of the interviewee quotes have been emphasised in bold by the author

An audit of the sustainability content of curriculum had also been started at the University, and this was referred to by a number of interviewees and at length throughout the interviews with U1 and U6. U1 thought that such an audit was vital as it related to the core business of the University (i.e., education provision); a distinction was drawn between core business and considering the environment when running the operations of the University. The audit would allow changes to be made that would improve sustainability education. U6 noted that the University Learning & Teaching Committee were very supportive of the audit.

In addition to the curriculum audit, there was some evidence that environmental and/or sustainability issues were being considered in decision-making. For example, as noted above, the University Environmental Officer stated that:

> *"Generally in Estates we try and look at the sustainable option. Everyone in the Estates team are quite keen to look at sustainability and impact. For example,* ***we looked at a replacement green roof for the boiler house. We didn't do it as the cost was quite high, not feasible****. But we looked into it, we were keen on it.....***the designer and project manager are aware of environmental issues and are keen to look at the sustainable option***."* (U3)[90]

However, 'incorrect' decisions from a sustainability perspective were also noted:

> *"You get a BREEAM sustainability tick for local products based on the distance from point of manufacture to the point of delivery, not from where the resource originally came from (EG China). That's daft. I'd say we've got our benchmarking wrong."* (U9)

> *One of my bugbears is about procurement. EG photocopiers. I don't think we've looked at them from a life-cycle analysis – just best value, cheapest."* (U6)

[90] U2 also noted that the early specifications of Campus C that were produced by the architects and project managers were dominated by sustainability.

Some interviewees were asked how sustainable they thought Campus C would be. The Environmental Officer thought that the BREEAM Excellent rating and building regs would make the campus ‘relatively sustainable’ and that BREEAM had helped to push energy efficiency, waste management and travel up the agenda. He also speculated that the level of specification required by BREEAM might have been costed out had it not been mandatory. U2 also thought that the BREEAM Excellent rating made Campus C *“a sustainable project”.* Three other interviewees stated that that Campus C would be more sustainable than the current estate (and then discussed problems with the current estate). One interviewee did recognise that a BREEAM Excellent rating was a relatively low benchmark for a new building.

In conclusion, while reporting of various environmental issues (actuals vs target) occurred to various university committees and boards, holistic reporting of sustainability issues did not occur. Some decisions were being taken with regard to environmental/sustainability issues, but some were not. Communication could have been improved. Further, the full sustainability impact of the new campus had not been measured. Reliance had been placed by some interviewees on an environmental performance measurement benchmarking tool (BREEAM) as a proxy for sustainability measurement (note: the dangers of this will be discussed further in the Section applying institutional theory below). Along with the lack of usage of sustainability measurement tools per se, this confirmed that the problematical situation noted in Chapter 3 was correct and that University X would benefit from the development and use of the ‘FCA for HE’ model.

Root definitions

The facts above will now be converted into baseline SSM root definitions using the PQR formula (‘do P, by Q, in order to contribute to achieving R’), in order to provide an exact calibration of sustainability discourse that the post-intervention situation can be compared with. Two root definitions will be built – sustainability discourse in general, and sustainability discourse in relation to Campus C.

Firstly, prior to the intervention, University X was measuring and reporting some of its sustainability impacts (P) by: publishing an environmental strategy; setting targets for key environmental areas (such as waste management/recycling, energy, transport and water); reporting actual vs target environmental figures twice-yearly to the Finance & General Purpose Committee; setting up a formal Environmental Management System; reporting initiatives (such as the conversion of waste vegetable oil into biodiesel) in its Annual Report; and conducting an audit of the sustainability content of its curricula (Q). These activities were being undertaken to achieve a number of things (R): keep customers happy; obtain funding; follow the behaviour of competitors; educate students about sustainable development; and satisfy a moral duty.

Secondly, University X was measuring the 'sustainability' of its new campus building, Campus C (P) by undertaking a BREEAM assessment (Q), in order to obtain grant funding and marketing collateral (R). Interviewees thought that the BREEAM Excellent rating would make the new campus more, relatively or wholly sustainable, and achievement of the rating was generally seen as a 'good thing'. Further, three interviewees felt that new builds would make institutions more sustainable, although this was seen as necessary but not sufficient for sustainability.

4.2.6.2 Reaction to proposals to account for sustainability

Interviewees reacted positively to the suggestion that accounting could be used to drive sustainability, the majority of interviewees agreed that universities should report their sustainability impacts and they were generally enthusiastic about the technique of FCA.

Interviewees were asked whether they thought that accounting could be used to drive sustainability. The interviewer then introduced interviewees/gave them more background on FCA by talking them through a pre-prepared factsheet, and also presented and talked through handouts covering an initial 'FCA for HE' model and the model development methodology. For a copy of the factsheet see chapter 3 Section 3.5.3. For a copy of the FCA for HE model see chapter 5, Figure 5.1c. For the model development methodology see chapter 3 Section 3.5.

Views expressed by interviewees regarding the content of the model were used to redesign the model ahead of the first project group meeting, and these are dealt with in chapter 5 Section 5.1.2.

Virtually all responses to the question of whether accounting could be used to drive sustainability were positive. Interviewees noted: the highlighting of financial benefits of more sustainable options; the raising of awareness and the fact that issues might be ignored if not monetised; that accountability was vital; the usefulness of monetary measures that people could relate to; the fact that FCA considered a broader set of issues that CBA; its usefulness for benchmarking; and the potential to change what people are doing.

> *"I think it is one mechanism and can be very helpful."* (U4)

> *"A lot of decision-making is driven by numbers. So, if a particular dimension is not captured by numbers it can often be left out. So it's worth having a go..... A lot of people can't move ahead without a figure. It's just another language to express a view you have of the situation. You can put a relative size on it... Is it 100 or is it 10? Even if it turns out to be 20, you are in the right ball park in terms of decisions you want to make."* (U5)

> *"I think it is absolutely vital. Not just desirable, vital. It is one of the most important tools we have – accountability."* (U6)

> *"**Because people are driven by money, if they can see a monetary value of what they are doing/using, I think it helps to raise awareness, makes them think twice about doing things or reassures them they are doing things in a sustainable way**. Putting a cost to it is another way of looking at*

sustainable development. Some people will be able to relate to that far better than other people can look at it. A monetary value to the FD of the university will mean far more than equating it to the number of trees that might be felled. So potentially it has a very useful role to play in reaching people that may not be reached in any other way. ***In the armoury of tools we might have to open our eyes to environmental problems and sustainable development this could be quite useful, so I'm happy to encourage you to follow this up****."* (U7)

"It's very worthy. It has significant potential to measure and change what people are doing." (U8)

"Trying to get an objective evaluation of sustainability is a good thing, for all sorts of reasons. You can benchmark yourself, you can see how you are performing, it gives you some kind of measure. For example, if you recycle your paper, put some sort of benefit to it .... it might cost you money actually ... if you've got some sort of model that puts this in context and brings in all the factors I fully support that." (U11)

However, U9 and U2 expressed reservations:

"I have absolutely no idea. Presumably you're going to say yes because you've got a model to do it later on. The concern I'd have it that it would be another layer of bureaucracy and admin that you'd have which would drive your costs up. So it needs to be as simple as possible." (U9)

"It seems an odd place for it to be driven from (that's my gut reaction). However, I can understand having read the papers provided where you are coming from and can see it's an approach that could work well." (U2)

Interviewees were asked whether universities should externally report their sustainability impacts (or report in more detail). Nine thought that external reporting should be undertaken (and one was non-committal); however, five of the people in the yes camp stipulated some caveats. It was felt that reporting might be burdensome (U1, U2) unless it was about reporting added value and sustainability core values rather than a list of activities undertaken (U1), and that it should not be too detailed (U5)[91].

Further, it was felt that care would need to be taken choosing and setting targets:

> *"I think it depends on what the targets are, how they are set, who sets them, and whether they are realistic, achievable, challenging. You can set targets and have accountability systems that are very weak and don't mean very much. I'm more interested in buy-in. What do the people say? Does it change the way they work?"* (U6)

It was also felt that reporting would be fine if it was voluntary, but that if it was enforced,

> *"…developments will be in areas that will hit people up and down a league table, and perhaps may not be genuine*." (U4)

The people in the 'yes' camp who did not have any reservations were very enthusiastic about reporting and saw the ability to disseminate best practice, plus benefits for the institution such as adding rigor, raising awareness and forcing people to put sustainability on the agenda. For example:

> *"…we should be reporting as if it's an end of year financial account. We should have an environmental account."* (U7)

> *"I can't see why not. I would have thought it would bring additional rigour to our own carbon offset and reduction programme and energy management if we were forced to report that. I can't see anything wrong with that*." (U8)

[91] U2 however felt that monitoring of sustainability might be more worthwhile than other areas: *I would have thought that this area would be a prime example of where it would have been worthwhile monitoring, rather than the 270 facts we collect for each student who comes through us.*

“Probably yes. By doing that it forces people to put it on the agenda. It’s an issue too important not to do that. The environment/sustainability is something that universities should keep high up the agenda and that is what we are doing.” (U11)

The person who did not commit expressed reservations about reporting due to the risk of non-comparability.

“Higher education introduced estates management statistics. Data is gathered each year. It has taken 10 years to get somewhere near common data. How do you measure an institution that has got lots of research, labs etc alongside an institution that hasn’t? How do you look at somebody that does lots of agriculture compared to others who don’t? Some institutions who have listed buildings versus others who have new builds? It’s a moving feast. You need some weighting so you are comparing apples and apples.” (U9)

Interviewees expressed both positive and negative opinions on the concept of FCA. People were generally enthusiastic about the technique, for example:

“Great way of looking at it. As you say, will be difficult to put a value on lots of things, but it seems to cover all the areas.” (U3)

“I like the idea of FCA as it makes people think about every aspect of the buildings, without that we’d still be thinking in a very narrow set of perspectives.” (U6)

[Interviewer: The numbers aren’t perfect with FCA but it is better than doing nothing.] “I agree. The argument has been around for a while in economics. How else do you compare apples and pears? There has to be some common denominator, and the easiest way to do that is to monetise.” (U8)

"I'm supportive of it .... I'm fully on board with the argument that if we go through the process it assists us in developing our strategies and highlighting issues we wouldn't highlight if we didn't go through this. I can understand entirely where you are coming from." (U2)

However, a number of pitfalls were raised. It was noted, given the difficulties in monetising all impacts identified, that: if values were not calculated for certain impacts then these might be ignored (U4, U11); incorrect or partial numbers might be taken as correct (U4); certain numbers might lack credibility or not be believable (U6); and it might be difficult to measure social impacts given that universities were complex bodies with wide and varied social and educational impacts on communities (U2). There was also a concern that the lifecycle of items might not be easy to predict given unknown future technologies (U4).

In conclusion, almost all interviewees thought that accounting could be used to drive sustainability. Most interviewees were also in favour of external reporting of performance, although some thought that this should be subject to conditions. Further, full cost accounting was generally well received, although some interviewees expressed concerns that some areas would not be able to be monetised and that these might be ignored. Ten interviewees agreed to join the project group, and this highlighted that they felt that this was a worthwhile and achievable project. Further, it demonstrated that interviewees were generally in favour of working to improve sustainability information and performance.

4.2.7 Sub-systems

Certain tangible organisational elements noted above could be seen as evidence of the commitment of the university to environmental issues. For example, the 2006/07 Annual Report noted initiatives such as biodiesel, infra-red lighting sensors, and eco-friendly design features of a recently built campus building. However, this author noted that initiatives had not always spread across all campuses, as Campus A had very few recycling points.

4.3 Institutional theory

4.3.1 Organisational fields and initiating events

One could speculate that a strong organisational field exists comprising of HE institutions in the UK that influence each other. Institutions are influenced by a large number of common factors, including for example: quality standards prescribed by national bodies such as the Quality Assurance Agency; subject and level benchmarks; and common funding regimes. Further, it could be argued that although institutions are competitors of each other, they typically co-operate in more ways than private sector business competitors – for example, there is generally a collegiate relationship between academics from different institutions, joint research initiatives/working occurs and academic expertise is shared and standards monitored via a network of external examiners. Welsh HE institutions are a distinct sub-set of this field, as they are overseen by a devolved government in Wales (and not the UK government) which sets funding levels via its own funding body, HEFCW. (A number of interviewees above noted a funding shortfall compared to universities in England).

It was noted when researching HE as a suitable test-bed for a new FCA application that there had been significant calls by government bodies, pressure groups and the HE sector itself for the sector to improve its sustainability performance and demonstrate its sustainability credentials – and these could be seen as common influences (in the area of sustainability) on all HE institutions in the sector. Examples included the Higher Education Funding Council for England report ‘Sustainable Development in Higher Education’ (see HEFCE, 2008 – a strategic statement and action plan), the People and Planet ‘Green League’ (a performance table produced by a student pressure group that ranks UK universities according to their environmental performance – see People and Planet, 2008), the Universities UK (2008) ‘Greening Spires’ report and sustainable development group, and the Welsh Assembly Government Education for Sustainable Development and Global Citizenship (‘ESDGC’) initiative (see

WAG ‘Strategy For Action’ document, 2008), as part of the Welsh Government’s sustainable development strategy.

In addition, the interviews detailed above noted: the leading of the ESDGC initiative by the Higher Education Academy (and a recent HEA conference to highlight exemplars in the sector and disseminate best practice, which some University X managers and this author attended); sustainability curriculum audits (recently completed by a leading local Welsh university and begun by University X); HEFCW funding for a monitoring and targeting system for gas, water and electricity (and a push for institutions to adopt an EMS); and the requirement for government funded buildings in Wales to meet the BREEAM Excellent benchmark. Public image, pressure from customers (students and businesses) and the influence of VCs and management were also noted as drivers of sustainable behaviour, with a lack of funding, inertia, ineffective and/or stifling policy, and the problem of developing curricula not accepted by business, society and economists seen as inhibitors of sustainability behaviour.

One could therefore conclude that an organisational field exists around the issue of the sustainability behaviour of HE institutions. Initiating events might cause change in all institutions (for example, changes to government policy in areas such as funding), or in one institution only (say the appointment of a new VC or a low placing in the ‘People and Planet’ league table). There is clear evidence of dialogue between institutions on this issue – for example, presentations at the HEA conference noted above (by exemplars to peers in the sector), and institutions coming to talk to University X about its environmental initiatives. This second point was noted when asking the Environmental Officer of University X about external reporting:

> *“...it helps to raise awareness, and I suppose it helps to share good practice as well, so that if you’ve had a particular success in one area, you can share it with, report it … and it helps other universities build a case towards ….. for example, with the bio-diesel here [production of bio-diesel from waste*

vegetable oil from the canteen], since raising awareness amongst the other universities, I've had a number of people phone me up and ask how we are doing it, they are thinking of doing it themselves, how do we go about doing it and what are the benefits. So I think that has encouraged a lot of universities. They've seen that University X has been able to do it, so…." (U3)

The most immediate disturbance/initiating event in this instance was the intervention of the researcher. This could be viewed with pessimism – researcher intervention had not tended to work in prior applications, and some of the most successful applications (in terms of FCA gaining traction) had occurred where there had been an evangelical CEO (see chapter 2). As noted earlier, the VC at University X was not deemed to be evangelical. However, to counterbalance this pessimism, the analysis above generally highlighted a positive response within University X to FCA.

4.3.2 Mechanisms/pillars

Using the mechanisms/pillars of institutionalisation highlighted in Chapter 2, one could sort the influences noted above. Whereas pressure from customers (including via league tables) and funding levers (such as monies available for environmental monitoring systems and grant requirements linked to environmental specifications such as BREEAM Excellent) would fit in the coercive/regulatory pillar, other examples such as the WAG/ESDGC initiative (and conference), the 'Greening Spires' report and curriculum audits would fit under the normative or cognitive/mimetic pillars. This might suggest that institutionalisation of sustainability is not just in its infancy in the sector and has gained a reasonable foothold as evidenced by influences across multiple pillars (Hoffman's work on environmental reporting in the USA (1999) suggested that institutionalisation progressed through the pillars), which offers encouragement for the acceptable of FCA.

However, interview answers above give some cause for concern regarding just how far sustainability ideals had been embedded across the sector and affected individual institutions. While interviewees exhibited a reasonable understanding of sustainability, in some cases views expressed were narrow. Some interviewees also had difficulty imagining what a fully sustainable institution would look like, and there appeared to be little widespread knowledge of exemplars in the HE sector. Further, it was noted above that some interviewees interpreted the BREEAM Excellent rating of the new campus as suggesting that it would be “relatively sustainable” (U3), a “sustainable project” (U2) or more sustainable than the current estate (three interviewees), and in general it seemed to be accepted as a ‘good thing’. Only a minority of interviewees expressed concerns over BREEAM – one interviewee pointed out that the BREEAM benchmarking was flawed (as points were awarded if the distance between the point of manufacture and point of delivery for building materials was minimised, irrespective of where original raw materials had been sourced from), and another thought that BREEAM was the minimum standard to be aiming for (*“there are higher standards/specs we could go for .... the fact we have got it is saying we have only stepped up to the right sort of podium”* U6). However, BREEAM is only an *environmental* performance measurement tool. The positive attitudes to it thus suggest a misunderstanding of its scope. Some interviewees were also optimistic about the current sustainability performance of the university, despite the lack of holistic measurement tools to gather such information and form an opinion; this suggests a misunderstanding of the current position. These misconceptions carry a potential danger for an FCA application. If the university is incorrectly assumed to already be operating in a sustainable manner and/or Campus C is assumed to be sustainable (or more sustainable) due to its BREEAM rating (which could be seen as evidence of ‘weak sustainability’ viewpoints amongst interviewees), then FCA might challenge the status quo and hence struggle to be accepted (a barrier to entry identified in Chapter 2). It potentially presents a heretic, ‘strong sustainability’ viewpoint, acting as an exposure tool that makes uncomfortable reading, forcing critical reflection on the un-sustainability of organisational practices (Brown & Frame, 2005) and ‘disturbing’ and ‘problematising’ normal narratives (Bebbington et al., 2007). If BREEAM Excellent represents the 'norm'/expected behaviour in the HE sector in Wales and is erroneously accepted as a measure of sustainability then a significant danger exists that the true impact of behaviour remains hidden as people place reliance on it; dangerous signals are sent and the rating does more harm than good as it attaches a badge of respectability and legitimacy to the (un)sustainable behaviour of the organisation. Indeed, BREEAM could be seen as an example of the institutionalisation of un-accountability or un-sustainability, with the 'dice loaded at the outset' (Archel et al., 2011). BREEAM could close down discussions as it is seen as a good thing, ticking the sustainability box. When it is challenged by FCA, managers might seek to subsume the heretic arguments into a 'weak sustainability', dominant viewpoint via the process of discursive decoupling.

As in other sectors, no explicit legislative, regulatory or market pressure for FCA per se appeared to exist in the HE sector[92] (although as noted above there had been general calls to improve and demonstrate sustainability performance). The WAG Strategy for Action document (WAG, 2008) did however call for the "use of life cycle costings for major build and refurbishment projects to be reviewed" (WAG, 2008, p. 67), and indicated that more work was needed to achieve this commitment. (Life cycle costing could be viewed as a technique akin to FCA, although it was unclear whether the Assembly intended institutions to include holistic sustainability indicators in their costings.) Any evidence that measurement of sustainability performance becoming the norm in the sector? Review of HE sus lit found that UK HE institutions did not appear to be measuring sustainability impacts in a holistic way. Lozano (2005) – found that sustainability assessment tools had been adopted for HE in some cases, but that many were deficient.

An additional barrier to entry for FCA noted in Chapter 2 was that FCA does not fit with traditional, positivistic accounting that requires accuracy and objectivity. It

[92] Also a barrier to entry for FCA noted in Chapter 2.

may be technically difficult and costly. There was some evidence of this viewpoint in the interviews responses, for example:

"The concern I'd have it that it would be another layer of bureaucracy and admin that you'd have which would drive your costs up. So it needs to be as simple as possible." (U9)

"I'm sceptical whether the number crunching element will work in the foreseeable future." (U2)

"I think the answer is it will do it well in some areas and in others it will be deficient." (U11)

"I imagine it could generate an awful lot of information, some of which is credible as it has figures attached to it, and large chunks which you think well, I could take it or leave it, that's someone's view, that's someone's impression." (U6)

4.4 SSM analysis 3: Political ~ information on power issues

As noted in chapter 3, this research study raised issues for the author as it involved interacting with and challenging senior management in the author's institution of employment.

During the duration of this research study the author was first employed as a Senior Lecturer (2 years) and then as an Academic Subject Leader (3 years) in the Business School. The finding out process required interviews to be conducted with a hierarchical chain involving grades of staff from Vice Chancellor to Heads of Department, and then ongoing contact in the project group with staff from Deputy Vice Chancellor downwards. During the main data gathering stages of the thesis (2008-2010) the author was relatively distant from the majority of these staff in terms of his day-to-day role, with the exception of a Dean of School and a Head of Department. It was only during 2010, when the author sat on the

University Academic Standards Committee, that he came in contact with some of the project group on a more regular basis. A significant internal reorganisation reduced the distance further in 2011 as the University cut layers of middle management leaving Heads of School and Academic Subject Leaders in much more direct contact with the two Deputy Vice Chancellors.

From 2009 the author was also managing staff who, along with the author, were being moved to Campus C when it opened in 2011, and some of these staff had significant operational concerns about moving. The author therefore had to deal with perceptions from his staff that he was ‘pro’ the new campus as he was researching it, and so would not deal with their concerns. Confidentiality issues also prevented the author from sharing details of the FCA calculations with his staff as they were being conducted.

It should also be noted that given the sensitivity of the new campus project with some staff and students there was a risk that senior management might halt the FCA for HE process/calculations.

CHAPTER 5: CASE STUDY MODEL DEVELOPMENT AND FCA CALCULATIONS

5.1 Development of the ‘FCA for HE’ model

5.1.1 Overview – model development and calculations

The ‘FCA for HE’ model was developed through a number of versions (1-5) as illustrated in Figure 5.1a below. It was road-tested by applying it to ‘Campus C’ and was used to assess the sustainability performance of the campus over a twenty year period. Sustainability impacts arising from the construction and use of the campus – and those arising due to its location – were measured and given monetary values. By Version 5 of the model, the impacts were reported under five categories which reflected the area of impact: environmental, resource, social, economic narrow and economic wide. The results from the model were presented in tabular and graphical form (see Section 5.3).

As noted in Chapter 3, Campus C replaced an existing site, ‘Campus A’, that was later sold and redeveloped for housing. In order to calculate the incremental impact of Campus C (in addition to its stand-alone impact), a theoretical continuation of Campus A over a twenty year period was projected and the impacts calculated were deducted from the Campus C impacts. Two Campus A continuation scenarios were projected and included in Version 5 of the FCA for HE model – a continuation of the campus in its original condition, and a continuation assuming that an ‘eco-refurbishment’ took place. The continuation figures were based on very rough estimates; however, the process illustrated how the FCA for HE model could be used in future applications for decision-making purposes.

In broad terms, impacts were calculated as follows by Version 5 of the model. Environmental impacts (which were negative except in some incremental cases)

<u>Figure 5.1a</u> – Development of 'FCA for HE' model (and calculations arising from model)

Key Dates:	Key Stages:		Chapter 5 Figures:
Nov 2007	'Construction SAM' model amended and applied to new campus ('Campus C') for initial research proposal presented to U11.	⇨	Figure 5.1b
Spring 2008	Model rebadged as 'FCA for HE' model Version 1. Used as a starting point for discussions with university staff.		
Interviews Aug-Oct 2008; 1st project group meeting 16th Jan 2009	FCA for HE model Version 1 revised following interviews (to Version 2); Version 2 presented at first project group meeting.	⇨	Figure 5.1c
Jan 2009	Graphical illustration of model produced for group *following* first project group meeting (Version 3)	⇨	Figure 5.1d
2nd project group meeting 13th November 2009	FCA for HE model Version 3 revised following first project group meeting (to Version 4); Draft 1 FCA calculations produced using Version 4, presented at second project group meeting.	⇨	Figure 5.1e
To Winter 2011	Minutes and action points arising from second project group meeting led to further model amendments (Version 5); final, second draft ('Draft 2') of calculations produced using final version of model.	⇨	Table and Figure 5.3a

were overwhelmingly based on estimated CO_2 emissions. These were costed based on the damage that they were deemed to cause, by applying a factor based on the social cost of carbon. Resource impacts (which again were negative except in some incremental cases) were based on the opportunity cost of using finite resources. The amount paid for non-recyclable materials and energy consumed (during construction/refurbishment), and fuel consumed (during use) was taken as a proxy for this opportunity cost. Social impacts (which comprised knowledge transfer outputs, and which were positive) were costed using existing studies as proxies. 'Narrow' economic impacts were based on campus income and expenditure projections. 'Wide' economic impacts were calculated by applying multiplier factors to campus income projections.

The remainder of this section critiques the development of the model. Sections 5.2 onwards then examine in detail and critique the calculations produced using the model.

5.1.2 Initial models

Figure 5.1b below shows the initial illustrative model produced by the author for the research proposal presented to U11. This model was rebadged as the 'FCA for HE' model, in order to be used as an aid to discussion in the 'finding out' interviews and the first project group meeting (FCA for HE model Version 1). These initial models revised the construction/property development Sustainability Assessment Model ('SAM') framework proposed by Bebbington & MacGregor (2005), to analyse the impacts of the new campus development of University X. The SAM was chosen as it was the most complete FCA methodology demonstrated in practice to date, and it had been highlighted as a form of FCA suitable for a dialogic application (see detailed discussion in chapter 2). However, the shortcomings of the SAM were recognised during the dialogic process (for example, they were discussed in the first project group meeting). The construction/property development version of the SAM was felt to provide a relevant framework for a new campus development. It was chosen in preference

<u>Figure 5.1b</u> – First illustrative model produced for University X research proposal (later rebadged as 'FCA for HE' model, Version 1)

Summary of the possible impacts of the development and use of the new campus:				
	Economic	**Resource**	**Environmental**	**Social**
	Income from Campus C over its life, split between:			
Construction	• Monies paid to contractors and professionals (architects, solicitors etc) • Purchase of raw materials & utilities • Returns to providers of finance	• Materials used in construction • Consumption of utilities (water, energy etc) • Creation of intellectual capital and infrastructure resources	• Pollution impacts from materials used in construction • Pollution impacts from consumption of utilities • Pollution impacts of waste	• Provision of employment and employee training (multiplier effects) • Effect of building design on crime
Use	• Monies paid to employees (management, academic & research, technical & admin, manual) • Training and staff development • Capital and operating expenditure (incl. depreciation) • Re-investment of surpluses	• Materials consumed in maintenance and refurbishment • Consumption of utilities (water, energy etc) • Creation of intellectual capital	• Pollution impacts from materials consumed in maintenance and refurbishment • Pollution impacts from consumption of utilities (water, energy etc) • Pollution impacts of waste	• Provision of employment and employee training (multiplier effects) • Capital and operating expenditure (multiplier effects) • Capital gains • Urban regeneration • Direct and indirect benefits of education provision • Provision of social facilities
Location		• Energy consumption by associated transport network	• Pollution impacts from associated transport network • Brownfield site – minimal loss of habitat and environmental damage? • Brownfield site – existing environmental risks? • Risk of flooding	• Scale and agglomeration economies • Accessibility and social exclusion

to the more recently developed Urban Development ('UD') SAM due to its relatively small number of headings, and hence its simplicity, which was seen as important by this author given the intention that the model should be an initial starting point to stimulate discussion and should hence not be over-prescriptive or complicated.[93]

Figure 5.1c shows the 'FCA for HE' model after the exploratory 'finding out' interviews, revised to take on board the suggestions of interviewees (FCA for HE model Version 2). Changes to the model (as compared to Version 1) are shaded. The key changes made were as follows.

Firstly, the 'Social' category (as per Bebbington et al.'s original model) was rebranded to 'Social/Economic (wide)', and correspondingly the 'Economic' heading was rebranded as 'Economic (narrow)'. This was undertaken to make clearer the fact that the 'Social' heading included economic multiplier effects (i.e., influences on the *wider* economy) arising from the income generated by the project ('Economic (narrow)'). Secondly, the notion of presenting the incremental impacts of Campus C was introduced. The idea was that these would be calculated by modeling the theoretical continuation of campus buildings that would be replaced by Campus C, and then presenting the incremental impacts of Campus C over and above these theoretical impacts. It was decided by the author to present the narrow economic impacts of the old and new campuses separately, and then to present the Social/Economic (wide), Resource and Environmental impacts in purely incremental terms. The narrow economic impacts were presented separately for transparency. However, as noted in Section 5.1.3 below, it was later felt by the project group that figures for all categories should be presented separately for Campus C and existing campuses, with an additional incremental analysis. (Note that some impacts in Figure 5.1c are not incremental as they represent new Campus C impacts.)

[93] The model was only intended as a starting point for discussions, in both the interviews at the 'finding out' stage and the project group meetings. It was decided by this author that, given the lack of knowledge of FCA that the project group parties would have, it would be necessary to start with a model rather than a blank piece of paper. It was recognised, however, that the final model developed by the project group might differ significantly from the model started with.

<u>Figure 5.1c</u> – Revised 'FCA for HE' model (Version 2) following interview feedback

NOTE: Changes to the model (as compared to Version 1) are shaded

Summary of the possible impacts of the development and use of the new campus:					
	Economic (narrow)		**Social / Economic (wide)**	**Resource**	**Environmental**
	Income from Campus C over its life, split between:	Hypothetical income from existing sites if new campus not built, split between:			
Construction	• Monies paid to contractors and professionals (architects, solicitors etc) • Purchase of raw materials & utilities • Returns to providers of finance		• **Multiplier effects:** • Provision of employment and employee training • Capital expenditure • Returns to providers of finance • Effect of building design on crime	• Materials used in construction • Consumption of utilities (water, energy etc) Creation of intellectual capital and infrastructure resources	• Pollution impacts from materials used in construction • Pollution impacts from consumption of utilities • Pollution impacts of waste Educational impact of 'BREEAM excellent' construction (ESDGC)
Use	• Monies paid to employees (management, academic & research, technical & admin, manual) • Training and staff development • Capital and operating expenditure (incl. depreciation) • Re-investment of surpluses	• Monies paid to employees (management, academic & research, technical & admin, manual) • Training and staff development • Capital and operating expenditure (incl. depreciation) • Re-investment of surpluses	• **Multiplier effects:** • Provision of employment and employee training ***** • Capital ex're (R&M and improvement ex're) and operating ex're ***** • ~~Capital gains~~ • Urban regeneration • Direct and indirect benefits of education provision ***** • Provision of social facilities *****	• Materials consumed in maintenance, refurbishment and improvement ***** • Consumption of utilities (water, energy etc) ***** Creation of intellectual capital (e.g. research output, **<u>creative capital</u>**) *****	• Pollution impacts from materials consumed in maintenance and refurbishment ***** • Pollution impacts from consumption of utilities (water, energy etc) ***** • Pollution impacts of waste ***** Educational impact of 'BREEAM excellent' construction (ESDGC)
Location			• Scale and agglomeration economies • Accessibility and social exclusion***** • Effects of campus move on student & staff	• Energy consumption by associated transport network *****	• Pollution impacts from associated transport network • Brownfield site developed vs greenfield site given up • Brownfield site – existing environmental risks? • Risk of flooding

*** = based on incremental positive/negative impacts (over and above the impacts of the existing campus sites)**

Thirdly, a number of additional impacts were included (and one was excluded pending consultation with the project group). In the 'Social/Economic (wide)' category, the multiplier effects relating to capital expenditure and returns to providers of finance were included for the construction phase, to add more detail. Further, the effects of the campus move on students and staff were included. Capital gains arising from the use of the campus were however crossed out (to be excluded pending consultation with the project group), as it was felt that the possibility of selling the new campus was remote. Under the 'Resource' category, examples were given of the types of intellectual capital that might be created – research output and creative capital. The creative capital in particular had been emphasised in the 'finding out' interviews; the new campus had been designed to create such capital, as it was planned that Art and Business School colleagues would teach and research together in the same space. Further, it was hoped that the campus would attract in many local businesses (and hence increase interaction with business) given its central city location[94]. Under the 'Environmental' category, two new impacts were included. The educational impact of the 'BREEAM Excellent' construction rating was included in both the Construction and Use phases; it was felt that positive publicity surrounding the rating might encourage more sustainable behavior amongst staff and students. Further, the impact of developing a brownfield site (as opposed to giving up a greenfield site) was included. The new campus was to be built on redeveloped industrial land, with the existing campus (situated in significant landscaped grounds) being sold. Finally, it was recognised that some impacts could apply across categories. Arrows were therefore added to the diagram to illustrate this. For example, while the creation of intellectual capital was noted in the resource category (as creation of a positive resource), an arrow was included to highlight that this might also be deemed to be a positive social impact.

In conclusion, ten changes were made between Versions 1 and 2 of the model when Figures 5.1b&c are compared. Version 1 contained 32 impacts, and so ten

[94] See discussion in Chapter 3 for more contextual information.

changes could be viewed as significant. However, the most significant changes related to category headings (economic narrow etc) and the incorporation of incremental figures. Other changes at the level of individual impacts in comparison were small (for example, new types of intellectual capital included) and did not alter the overall ethos of the model.

5.1.3 Model development by the project group – first project group meeting

As noted in chapter 4 the project group chaired by the author first convened on 16th January 2009 with the purpose of building a revised 'FCA for HE' model that accommodated a number of worldviews. Version 2 of the model was presented as a starting point for discussions at this first formal meeting. The author discussed how the model had altered, and explained changes to the group.

A number of key conclusions were drawn by the project group by the end of the meeting. These were as follows. Firstly, individual participants expressed an interest in monetising the vast majority of the impacts presented, although there was a bias towards measuring and monetising the social, resource and environmental impacts. The impacts labelled A, B etc in Figure 5.1d represent those that individual participants ranked in their 'top 5' (the key to the Figure identifies who the participants were). Secondly, a number of new impacts over Version 2 were identified by U8 and U9 respectively – the 'cost of University management time' and 'Extra expenditure required to achieve the BREEAM Excellent rating' (both impacts within Economic narrow, Construction). Thirdly, it was felt that the impact of the new campus should be measured over as long a period as possible – at least 20 years and ideally over whole life cycle (although it was recognised that the accuracy of forecasts would diminish over time, and that they would be affected by unanticipated events outside of the control of the University). Fourthly, it was decided that the monetisation of negative impacts should be based on damage incurred, with a secondary avoidance or restoration cost measurement (if possible) based on the 'best remedy' available ('the best that we could have done if we'd done it differently', (U8)). Fifth, for clarity, it was thought that it might be wise to present two sets of calculations: the 'stand-alone' impacts of the new campus ('type (a)' calculations), and the incremental positive and negative impacts compared to the existing campus that would be demolished ('type (b)' calculations). Sixth, it was felt that comparisons with the existing campus should be made wherever possible, with reductions in impacts such as pollution from energy usage, the associated transport network etc being seen as a positive benefit. Finally, it was decided overall that the project was worthwhile, but that it was over-ambitious; it was therefore recognised that measurement and monetisation of some impacts would not be possible or practicable at the current time by the project. The impacts that were 'deferred' were as follows: the educational impact of Campus C achieving a BREEAM Excellent rating; a comparison between Campus C and the work required to maintain Campus A; incremental calculations of waste generated in use; the impact of moving from a 'green-field' site; incremental creation of intellectual capital when using Campus C; provision of social facilities; and indirect educational benefits. In particular, it was felt that it might be difficult to highlight the incremental impact of the new campus on employment, education provision etc given that Schools (Faculties) were being moved that already existed.

The conclusions were circulated to the group shortly after the meeting. An illustrative model output graph was also circulated. This essentially presented a new, revised version of the model ('Version 3') which took into account the project group feedback, in a form that illustrated what the potential output from use of the model might look like (Figure 5.1d). The graph also linked to an action plan to obtain impact data (including the analysis of impacts that would probably not be monetised), and logged the impacts that were deemed important by the project group participants. The illustrative graph was required as some project group participants had stated in the meeting that they were struggling to envisage what the output from the model might look like. This was probably due to a number of different ideas being discussed in the meeting which would lead to alterations of the model, but the model not being physically altered *in* the meeting in front of the participants. Further, the diagram of Version 2 of the model presented in the meeting in hindsight might have been overcomplicated and difficult to absorb.

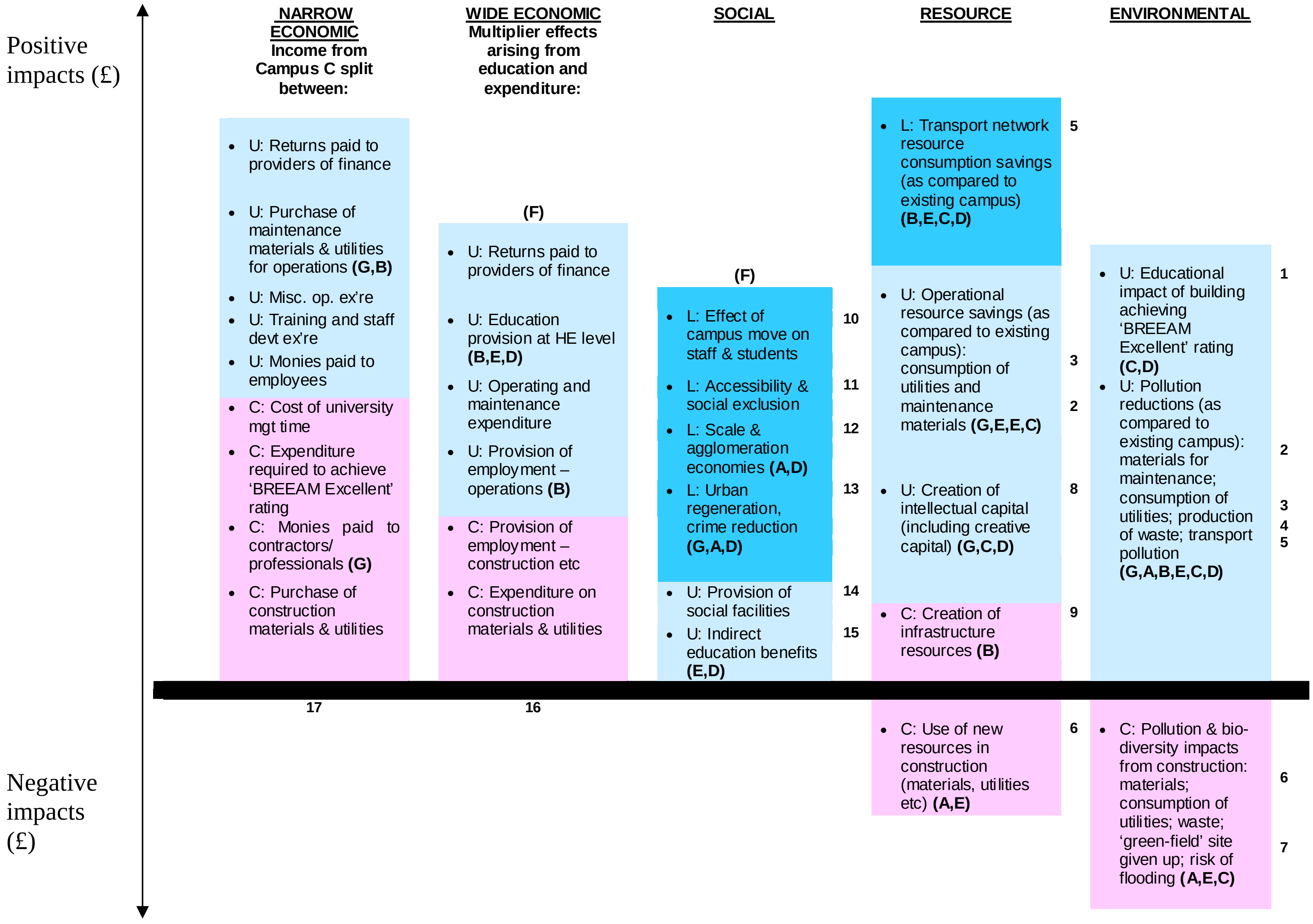
The output graph in Figure 5.1d attempted to illustrate how the data from the FCA calculations might be presented in the manner of a stacked bar chart, in the style of Bebbington et al.'s original SAM. It highlighted the anticipated positive or negative impacts (and for the social, resource and environmental categories, the anticipated *incremental* positive or negative impacts where calculable) that might arise from the new campus. (Incremental economic impacts were not explicitly presented in order to keep the analysis simple and understandable.) As no numbers had been calculated at this stage, the bars in the chart were not intended to portray the size of impacts in monetary terms – they were simply illustrating what the impacts might be and whether they might be positive or negative. Given the space available in the diagram, the descriptions of some impacts were shortened or amalgamated for brevity[95]. However, the diagram also introduced any new ideas/alterations based on suggestions at the project group meeting and/or due to author refinement/tidying, so it can be seen as a new version ('Version 3') of the model. Changes are summarised in Table 5.1a. It can be concluded that, as with the changes between Versions 1 and 2, there was no significant change to the overall ethos of the model. There were very few completely new impacts (2) – most alterations were due to impacts being moved between categories/phases or being reworded.

[95] This may have had the unfortunate consequence of losing the visibility of items for the remainder of the duration of the project, namely: research output (part of the creation of intellectual capital in the use phase) and brownfield site development/risks (part of construction pollution measure). It also appears that two impacts unintentionally disappeared when the diagram was produced (which again were lost going forward): the creation of intellectual capital at the construction phase and the educational impact of BREEAM at the time of construction.

<u>Table 5.1a</u> – Summary of alterations between Versions 2 and 3 of model

Category	**Alteration**	**Explanation**
Economic (narrow)	‘Returns to providers of finance’ moved from ‘Construction’ to ‘Use’ phases	Tidying up/refining by author.
	Slight wording changes to capital and operating expenditure	Tidying up/refining by author.
	‘Cost of University management time’ introduced in ‘Construction’ phase	Suggested by U8 in project group meeting (‘PGM’).
	‘Expenditure required to achieve BREEAM Excellent rating introduced in ‘Construction’ phase	‘Premium’ (extra expenditure) raised in PGM by U9.
Economic (wide)	Separation out of ‘Economic (wide)’ category from ‘Social’ category	First discussed with U8 in finding out interview; omitted from Version 2, but included on re-review of interviews.
	‘Returns to providers of finance’ moved from ‘Construction’ to ‘Use’	Tidying up/refining by author.
	Multiplier effects from CAPEX during construction phase split into: Provision of employment – construction; and Expenditure on construction materials and utilities (however, these were only slight wording changes)	Tidying up/refining by author.
Social	‘Urban regeneration’ impact moved from ‘Use’ phase to ‘Location’	Discussions in PGM.
	‘Effect of building design on crime’ altered to ‘Crime reduction’ and moved from ‘Construction’ phase to ‘Location’	Idea of author.
	‘Direct education benefits’ from use removed	Continuation of service already provided at existing campus.
Resource	Removal of ‘research output’ from creation of intellectual capital	Brevity.
	Creation of intellectual capital removed from construction	Error.
Environmental	Brownfield site development and risks removed	Brevity.
	Educational impact of BREEAM Excellent rating removed from construction	Error.
	‘Transport pollution’ moved from ‘Location’ to ‘Use’ (inconsistent with Resource category)	Author error.

<u>Figure 5.1d</u> – illustrative FCA output (including impacts discussed and agreed at first project group meeting; essentially 'Version 3' of model)



KEY (Figure 5.1d):

C	- Possible impacts during the **CONSTRUCTION** phase of the new campus
U	- Possible impacts during the **USE** phase of the new campus
L	- Possible impacts due to the **LOCATION** of the new campus

To denote impacts that project group participants ranked in their 'top 5' – identity of participant logged against impact as follows:

A	- University Environmental Officer (U3 in interview chapters)
B	- Director (U4 in interview chapters)
C	- Director (U6 in interview chapters)
D	- Dean (U8 in interview chapters)
E	- Director (U9 in interview chapters)
F	- Director (U10 in interview chapters)
G	- University Senior Management (U11 in interview chapters)

1,2 etc – extra notes (not reproduced here) relating to whether it was felt that the impacts could be measured at the present time by the project, and if they could, the activity measurement details and sources of data necessary (linked to participants)

5.1.4 Model revisions between first project group meeting and presentation of first draft of calculations

The first draft of calculations undertaken using the developing model were worked on between January and November 2009. A number of alterations were made to the model framework by the time that the calculations were made available to the project group, just prior to the second meeting of the group on 13th November 2009. Figure 5.1e below illustrates the version of the model used by this stage ('Version 4'). The changes made between Version 3 and Version 4 mainly reflected either new data found by the author or new ideas of the author (although some suggestions made at the project group meeting were incorporated) – see Table 5.1b below for a summary. New impacts that were included were the pollution impact of 'fit-out' materials and the pollution impact of purchasing IT equipment and paper. Amended impacts included were the impact of housebuilding on the Campus A site and the effect on staff and students on crime. As with the previous iteration, changes were therefore relatively minor (although the two amended measures produced significant monetary figures).

It was felt that the introduction of new impacts by the author was not undemocratic; these could be road-tested and accepted or rejected at the second project group meeting. Further, Version 4 of the model based projections on a twenty year time period, utilised 'damage costs', and attempted to show stand-alone impacts for Campus C, theoretical impacts for Campus A and incremental impacts for Campus C in separate analyses (as all agreed at the first project group meeting).

Tabular and graphical outputs from the model and the calculations were developed by the author for the Draft 1 calculation report that was presented to the project group. (Similar graphical outputs had been used by Bebbington et al. for the original SAM.) The format of these outputs remained similar for the Draft 2 calculations, and the Draft 2 outputs can be viewed in Section 5.3.

<u>Figure 5.1e</u> – Illustration of Version 4 of FCA for HE model (used to produce Draft 1 of FCA calculations); incremental calculations shown

		Economic (narrow) (£)	Economic (wide) (£)	Social (£)	Resource (£)	Environ-mental (£)
Cons'n:	Direct construction ex're	**35,000,000**				
	Misc. project expenditure	**4,000,000**				
	Multiplier effects - building ex're		Not applic'l			
	Opportunity cost of resources consumed				**-28,000,000**	
	Creation of infrastructure resources				Not avail.	
	Pollution impact of cons'n materials					**-594,042**
	Pollution impact of 'fit-out' materials					Not avail.
	Pollution - utilities used in construction					**-11,532**
	Pollution - construction waste					-
	Pollution - demolition of Campus A					Not avail.
	Impact of housebuilding on Campus A site	Not avail.	Not avail.	Not avail.	Not avail.	**-5,077,369**
Use:	Returns paid to providers of finance	**6,058,405**				
	Misc. operating ex're	**0**				
	Maintenance costs & utilities	Not split out				
	Training and staff devt ex're	Not split out				
	Monies paid to employees	**0**				
	Other campus gains/losses	**31,987,643**				
	Multiplier effects - campus income		**67,314,336**			
	Provision of social facilities			Not avail.		
	Indirect education benefits			Not avail.		
	Opportunity cost - energy resources				**1,157,162**	
	Creation of intellectual capital				Not avail.	
	Pollution - gas, electric					**336,402**
	Pollution - water					Not avail.
	Pollution - waste					Not avail.
	Pollution - IT (non-energy)					Not avail.
	Pollution - paper (incl. library books)					Not avail.
Location:	Opp. cost - resources used in transport				**7,266,078**	
	Pollution - transport					**480,635**
	Effect of campus move on staff & students			Not avail.		
	Accessibility & social exclusion			Not avail.		
	Scale & agglomeration economies			Not avail.		
	Benefits of urban regeneration			Not avail.		
	Effect on staff & students of crime			**-4,966,198**		
		77,046,048	**67,314,336**	**-4,966,198**	**-19,576,760**	**-4,865,906**

Table 5.1b – Summary of alterations between Versions 3 and 4 of model

Category	Alteration	Explanation
Economic (narrow)	Simplification of 'construction expenditure' (use of 'direct construction expenditure' and 'miscellaneous project expenditure' impact headings rather than 'monies paid to contractors/professionals' and 'purchase of construction materials and utilities')	Data availability
	Addition of 'other campus gains/losses' impact	Similar to 'reinvestment of surpluses' heading from Vsn 2; reflection of fact that calculations could show losses
	Cost of University management time – excluded	As data could not be obtained to determine these items, they were excluded from the Version 4 summary model (although they were retained in detailed tables in the calculation report). In hindsight, the headings *should* have remained in the summary.
	Expenditure required to achieve BREEAM Excellent rating - excluded	
Economic (wide)	'Provision of employment' and 'expenditure on construction' multipliers amalgamated into 'multiplier effects of building expenditure'	Tidying up/refining by author
	Multiplier effects of campus income – not split as in Version 3	Ease of calculation
Social	Alteration of 'crime' impact from 'crime reduction' to 'effects of staff and students on crime'	Broader heading to recognise both positive and negative headings
Resource	No separation of 'creative capital' from 'intellectual capital' impact	Difficulty of calculation
Environ-mental	Split out of 'pollution impact of construction materials' in 'Environmental' category – 'fit-out' materials separated out	Data available in BREEAM assessment
	Addition of 'pollution impact from demolition of Campus A'	Idea was introduced in project group meeting and included in post-meeting summary; however, now made explicit in model.
	Addition of 'pollution impact of housebuilding on Campus A site'	Idea of author; re-wording of 'green-field' site impact from Version 3.[96]
	Addition of 'non-energy pollution from IT' impact	Due to feedback at 2009 CSEAR conference
	Addition of 'pollution from paper purchases (incl. library books)' impact	Due to feedback at 2009 CSEAR conference
	Switch back of 'pollution caused by transport' impact from 'Usage' section to 'Location' section	Error in Version 3

[96] It appears that some important biodiversity impacts were lost from the model between Versions 2 – 4, which was due to the pressure of the scale of the project pushing out initial ideas. An environmental assessment had been undertaken of the brownfield site that Campus C was to be built on, and measures were put in place to protect certain flora and fauna, such as a type of 'prickly lettuce' that provided a habitat for moth species and the shad fish species that mated in the river adjacent to the Campus C construction site – but this was not considered. The potential loss of biodiversity from the Campus A site where surrounding grounds were turned over from extensive parkland to a housing development were also lost in the more rudimentary measure looking at the carbon impact of building new homes.

5.1.5 Model revisions between second project group meeting & presentation of second (final) draft of calculations

The second meeting of the project group (dated 13th November 2009) reviewed the Draft 1 FCA calculations (produced using Version 4 of the FCA for HE model), effectively line-by-line. The group noted a number of issues/work required to complete the second draft of calculations. However, the issues were related to the need to fill in figures where headings were blank or to refine figures already calculated; there were no calls to amend the model further.

The issues/work noted by the project group were as follows. Firstly, it was recognised that further checks on/corroboration of Draft 1 figures against additional sources were necessary, for example by checking material or utility quantities with the building contractor quantity surveyor and/or environmental officer, conducting wider transport surveys, checking discrepancies in economic multiplier factors, and conducting further literature searches to highlight more activity or cost conversion factors. Secondly, it was recognised that some gaps in the analysis needed to be ‘filled in’ – for example, the impacts of fit-out materials, waste generated, demolition of the Campus A site, the purchasing of IT equipment and books, and the creation of intellectual capital. Thirdly, it was noted that there was a need to refine the estimates of the resource impacts of building Campus C, to take into account the fact that some materials would be recyclable. Fourthly, it was decided the figures included in Draft 1 re the effects on staff and students of crime should be removed, as it was felt that that this impact was far too complex to model. Finally, it was agreed that Campus C income projections (and the split of expenditures) should be refined, by: building in a ‘positive spike’ for the effect of the new campus on recruitment; attempting to model the impact of a move in the student mix (towards full-time students etc who might be attracted by a new building); and attempting to model the benefits of proceeding with the project at the current point in time (as opposed to in future years when competitor positions will have changed).

Minutes and action points arising from the meeting were circulated to the project group members, and the author then set about producing the second, final draft of FCA calculations. Section 5.3 below illustrates the final model framework used for the final/Draft 2 calculations.

Any alterations made to the *model* in order to calculate Draft 2 of the calculations were due to new data found/not found by the author (in the case of: other monies paid to contractors; the split of operating expenditure; international student multiplier effects; and knowledge transfer outputs) or tidying up of calculations (multiplier effects – building expenditure). Changes to individual impacts are summarized in Table 5.1c below. It can be seen that these represent the smallest number of changes since the evolution of the model began with Version 1.

In addition to these changes, it should also be noted that three significant macro-level changes were made. Firstly, it was decided by the author to move the environmental, resource and social impact categories to the left of the table summarizing the model output. This was undertaken as the monetary values produced for these categories in the Draft 1 calculations had been dwarfed by the economic figures. They were therefore moved to test if this would give them additional prominence. Secondly, the model was amended to include a hypothetical continuation of Campus A assuming that an ‘eco-refurbishment’ took place. This alteration allowed the decision-making potential of the model to be showcased more effectively. Thirdly, a version of the model output was presented where impacts were costed utilizing a highest available social cost of carbon. These last two macro-level changes are discussed in more detail in Sections 5.4 onwards below.

It should also be noted that the later versions of the model (and the Draft 1 and 2 calculations) did not attempt to include avoidance/restoration costs. It had been suggested at the first project group meeting that while negative impacts should be measured using damage costs, a secondary avoidance or restoration cost measure (if possible) based on the 'best remedy' available ('the best we could have done if we'd done it differently') should also be included. Avoidance/restoration costs were not explicitly raised in the second project group meeting, and these costs were not included in the model or calculations simply due to the overall volume of work involved with the calculations in general. They would however have provided a useful comparator to the damage costs calculated. If damage costs illustrate the damage caused by constructing and operating Campus C, avoidance/restoration costs would show how much it would cost to either abate or avoid those costs. Avoidance/restoration costs viewed on their own can appear unpalatable. However, they may appear more attractive when an organisation is faced with the (damage) costs of its actions, which may become internalised in the future due to governmental or market pressures.

<u>Table 5.1c</u> – Summary of alterations between Versions 4 and 5 of model

Category	Alteration	Explanation
Economic (narrow)	Inclusion of 'other monies paid to contractors' impact	New data, allowing split out of direct construction expenditure
	Removal of 'maintenance costs and utilities' and 'training and staff development expenditure' impacts	Not possible to split out from misc. operating expenditure heading
Economic (wide)	Addition of 'multiplier effects – international student expenditure' impact	New data available
	Removal of 'multiplier effects – building expenditure' impact	Not required as multiplier effects included in campus income multiplier calculation
Social	Addition of 'knowledge transfer outputs' impact	New data available
	Removal of 'provision of social facilities' impact	These impacts were partially included in the new 'knowledge transfer outputs' measure, and they were still noted in the detailed report. However, in hindsight it may have been prudent to keep the headings in the summary model tables.
	Removal of 'indirect education benefits' heading	

5.1.6 Conclusions – model development process

We will now compare FCA for HE model Version 1 with the final Version 5 (for example, as illustrated by Tables 5.3a-c) in order to illustrate the amount of change that occurred during the model building process.

Applying a SSM root definition ('do P, by Q, in order to achieve R'), Version 1 of the model proposed to measure the sustainability of Campus C ('P'), using a variant of FCA ('Q'), in order to contribute to organisational change ('R'). 'Q' involved measuring and monetising the sustainability impacts arising due to the construction and use of the campus, and because of its location. Impacts were sorted into four categories which reflected the area of impact (economic, resource, environmental and social), based on Bebbington & MacGregor's construction/property development SAM (2005).

By the time that model Version 5 had been developed, the overarching root definition was still exactly the same - measure the sustainability of Campus C ('P'), using a variant of FCA ('Q'), in order to contribute to organisational change ('R'). However, the mechanics of 'Q' (the variant of FCA) had changed considerably.

Significant 'macro' changes had occurred to the model. Firstly, in Version 5, five categories rather than four were prescribed: environmental, resource, social, economic narrow and economic wide. 'Economic narrow' was a re-badging of the original 'economic' category; the multiplier effects arising from this economic activity were extracted from the original 'social' category and placed in a new 'economic wide' category, for clarity. Secondly, in order to calculate the incremental impact of Campus C (in addition to its stand-alone impact), a theoretical continuation of Campus A was projected (both in its existing state and after undergoing an 'eco-refurb'), and the impacts were deducted from the Campus C impacts. Stand-alone and incremental calculations were presented separately.

Overall rules were also set that had not been prescribed by the Version 1 model. Primary calculations were to be conducted using damage costs, with a secondary calculation using avoidance/restoration costs (although this was not possible in practice). Further, the operation of Campus C (and the theoretical continuation of Campus A) was to be projected forward for a period of twenty years.

In terms of individual impacts captured by the model, Version 1 contained thirty four. Version 5 (per Table 5.3a) contained thirty two. As noted in the Sections above, various impacts were renamed, moved, combined, split, excluded or introduced during the model-building process that spanned the five versions of the model, mainly due to project group or author ideas, or (non)availability of data. However, a core of approximately twenty impacts can be traced through from Version 1 to Version 5 (using judgement, due to impact categories being re-named, combined and split). Further, nine new impacts were introduced between versions which made it through to Version 5, namely: the pollution impacts of Campus C 'fit-out' materials, demolishing Campus A, building houses on the vacated Campus A site, and purchasing IT equipment and paper resources; the multiplier effect of International student expenditure; knowledge transfer outputs; the effect of the campus move on staff and students; and the effect on staff and students of crime. It can therefore be concluded that while there was some continuity, there was also significant change, which in part reflected the input of the project group members in the initial interviews and then the project group meetings. The periods between model Versions 1&2, 2&3 and 3&4 saw the greatest number of model changes (as measured by alterations to impact sub-categories). These were: the period between the initial interviews and the first project group meeting (Versions 1&2); the period immediately following the first meeting (Versions 2&3); and the period during which the first draft of calculations were performed (Versions 3&4).

Overall, the model development process led to a reasonable amount of engagement by the project group participants. The first project group meeting in particular was well attended, with 8 participants excluding the author (these participants represented 80% of the people who volunteered to attend the group in the 'finding out' interviews). By the second meeting there were a significant number of absentees - there were 5 participants present excluding the author (40% of the original volunteers; see chapter 3, Table 3.1 for an analysis of who attended each meeting). Feedback was however obtained from two of the people absent from the second meeting, U11 and U8, by e-mail and via a separate meeting respectively; they had wanted to attend but were prevented by diary commitments. Factors that may have reduced the level of engagement (including the 'artificial' timing of the study, the length of time between meetings, the lack of information flows between meetings and power issues) are explored during the analysis of post-implementation interviews in Chapter 6.

The analyses in the Sections above have noted a small number of errors and emissions. The visibility of some impacts was lost as they were combined in broader measures (for example, research output into creation of intellectual capital in the use phase) and some impacts appear to have been excluded in error between model versions (for example, the creation of intellectual capital and the educational impact of BREEAM at the time of construction). Further, when data was not found for some impacts, the headings were excluded from the final *summary* model presented (for example economic narrow 'maintenance costs and utilities' and 'training and staff development expenditure' impacts), although headings *were* retained in disaggregated tables in the calculation report. If more than one person had co-ordinated the building of the model and produced the calculations, such errors could have been avoided (see recommendations in chapter 7).

Version 2 of the model that was presented at the first project group meeting may have been overcomplicated, and this may have led to the reluctance of the participants to engage in ‘new’ model building of their own to reflect their own worldviews, despite promptings by the author. However, the author was wary of pushing the group in the meeting as many of the participants were his superiors in the University. The meeting was still successful as it led to a democratically developed, revised model.

In conclusion, the final model produced both reflected people’s views and was robust for calculation purposes (given the success of the calculations as noted in Section 5.9).

5.2 FCA calculations – overview

<u>Table 5.2</u> – Summary of Draft 2 (final) FCA calculations

Impacts	**Environ-mental**	**Resource**	**Social**	**Economic (wide)**	**Economic (narrow)**	**Link to outputs in Section 5.3 and Appendix B**
	£'m	£'m	£'m	£'m	£'m	
Stand-alone Campus C	-10.8	-53.7	2.5	348.1	244.6	***Table & figure 5.3a***
Stand-alone Campus C (highest social cost of carbon) #	-234.8	-53.7	2.5	348.1	244.6	***Appendix B: Table & figure B2***
Campus A continuation (no eco-refurb)	-9.5	-56.1	1.9	250	175.9	***Appendix B: Table & figure B3***
Campus A continuation (eco-refurb)	-8.9	-56.1	2.2	286	200.4	***Appendix B: Table & figure B4***
Incremental Campus C as compared to Campus A (no eco-refurb)	-1.3	2.4	0.6	98.1	68.7	***Table & figure 5.3b***
Incremental Campus C as compared to Campus A (with eco-refurb)	-1.9	2.4	0.3	62.1	44.2	***Table & figure 5.3c***
Link to Section containing detailed commentary	***Section 5.4***	***Section 5.5***	***Section 5.6***	***Section 5.8***	***Section 5.7***	

\# *Note – this is the only row in the table that utilizes the highest social cost of carbon*

5.2.1 Summary results

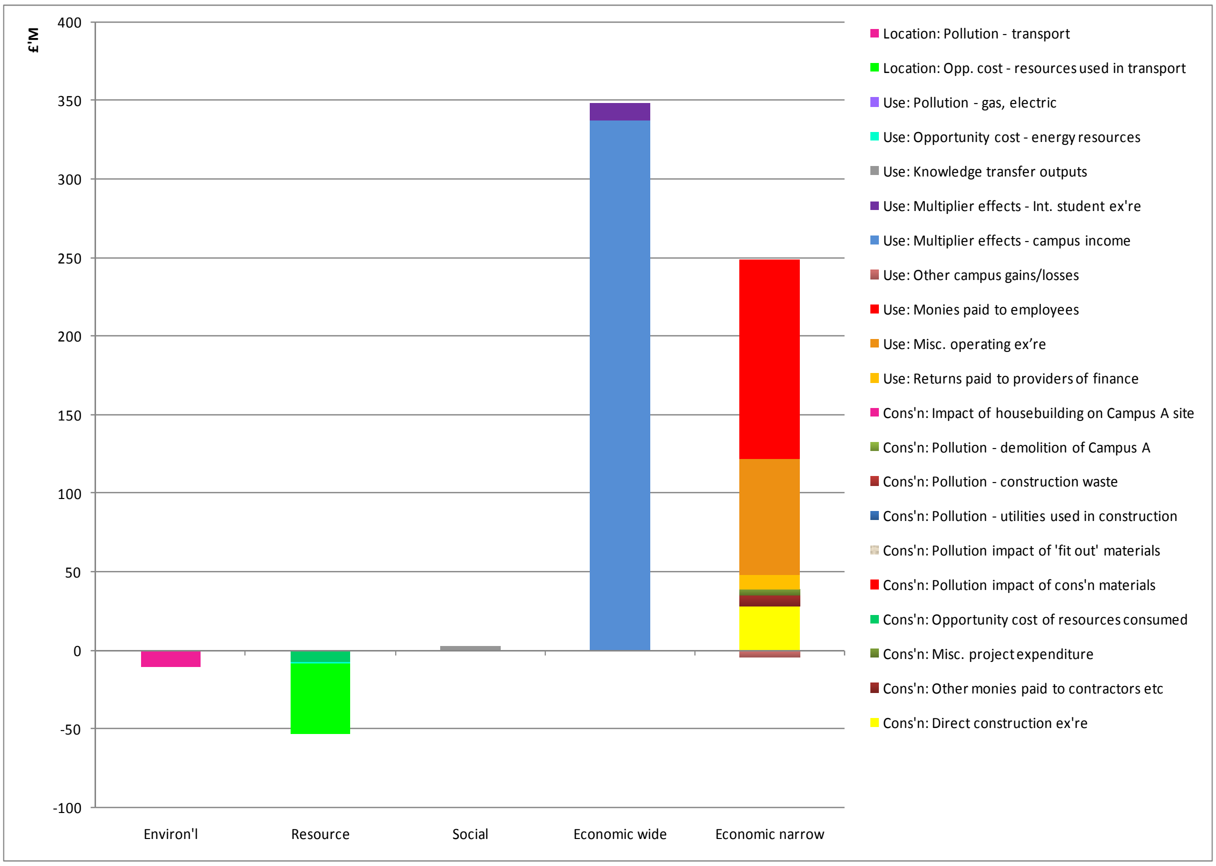
Applying Version 5 of the FCA for HE model to Campus C (and Campus A) produced the monetised impacts in Table 5.2 above. As noted in Section 5.1, two drafts of FCA calculations were undertaken, each produced following project group meetings. The summary figures below represent the *second, final* draft of calculations. These are compared with the Draft 1 figures in the commentary below and in the detailed sections that follow. Section 5.3 reproduces some of the full tabular and graphical breakdowns of the Draft 2 figures as they were presented to the project group (the full suite are reproduced in Appendix B). Sections 5.4 – 5.8 then provide a detailed critical narrative on the Draft 1 and Draft 2 calculations for each of the five categories. Section 5.9 draws conclusions.

5.3 FCA calculations – tabular and graphical breakdowns of figures

Table 5.3a – Campus C stand-alone sustainability impacts (average social cost of carbon)

		Environ-mental (£)	Resource (£)	Social (£)	Economic (wide) (£)	Economic (narrow) (£)
Cons'n:	Direct construction ex're					**28,000,000**
	Other monies paid to contractors etc					**7,000,000**
	Misc. project expenditure					**4,000,000**
	Opportunity cost of resources consumed		**-7,661,500**			
	Creation of infrastructure resources		Not avail.			
	Pollution impact of cons'n materials	**-618,163**				
	Pollution impact of 'fit-out' materials	**-248,823**				
	Pollution - utilities used in construction	**-25,376**				
	Pollution - construction waste	**-714**				
	Pollution - demolition of Campus A	**-66,581**				
	Impact of housebuilding on Campus A site	**-1,695,080**				
Use:	Returns paid to providers of finance					**8,881,058**
	Misc. operating ex're					**74,083,037**
	Monies paid to employees					**126,784,276**
	Other campus gains/losses					**-4,161,453**
	Multiplier effects - campus income				**337,529,948**	
	Multiplier effects - Int. student ex're				**10,567,059**	
	Knowledge transfer outputs			**2,517,569**		
	Opportunity cost - energy resources		**-896,623**			
	Creation of intellectual capital		Not avail.			
	Pollution - gas, electric	**-280,722**				
	Pollution - water	Not avail.				
	Pollution - waste	Not avail.				
	Pollution - IT (non-energy)	Not avail.				
	Pollution - paper (incl. library books)	Not avail.				
Location:	Opp. cost - resources used in transport		**-45,101,542**			
	Pollution - transport	**-7,861,906**				
	Effect of campus move on staff & students			Not avail.		
	Accessibility & social exclusion			Not avail.		
	Scale & agglomeration economies			Not avail.		
	Benefits of urban regeneration			Not avail.		
	Effect on staff & students of crime			Not avail.		
		-10,797,364	**-53,659,665**	**2,517,569**	**348,097,007**	**244,586,919**

<u>Figure 5.3a</u> – Campus C stand-alone sustainability impacts (graphical; average social cost of carbon)

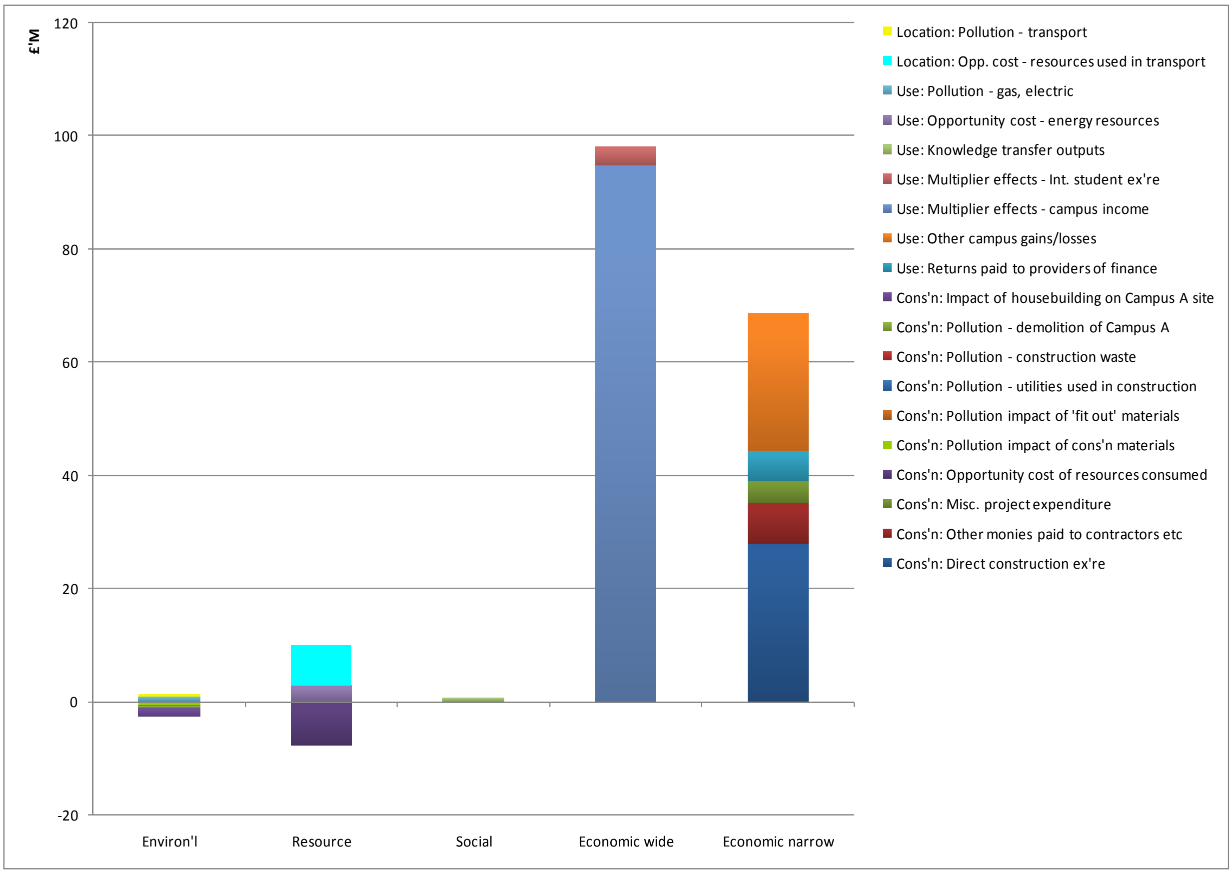


<u>Table 5.3b</u> – Campus C incremental impacts (versus hypothetical Campus A impacts assuming no eco-refurb; average social cost of carbon)

		Environ-mental (£)	Resource (£)	Social (£)	Economic (wide) (£)	Economic (narrow) (£)
Cons'n:	Direct construction ex're					**28,000,000**
	Other monies paid to contractors etc					**7,000,000**
	Misc. project expenditure					**4,000,000**
	Opportunity cost of resources consumed		**-7,661,500**			
	Creation of infrastructure resources		Not avail.			
	Pollution impact of cons'n materials	**-618,163**				
	Pollution impact of 'fit-out' materials	**-248,823**				
	Pollution - utilities used in construction	**-25,376**				
	Pollution - construction waste	**-714**				
	Pollution - demolition of Campus A	**-66,581**				
	Impact of housebuilding on Campus A site	**-1,695,080**				
Use:	Returns paid to providers of finance					**5,472,197**
	Misc. operating ex're					**0**
	Monies paid to employees					**0**
	Other campus gains/losses					**24,222,713**
	Multiplier effects - campus income				**94,798,975**	
	Multiplier effects - Int. student ex're				**3,253,313**	
	Knowledge transfer outputs			**570,407**		
	Indirect education benefits			Not avail.		
	Opportunity cost - energy resources		**2,815,464**			
	Creation of intellectual capital		Not avail.			
	Pollution - gas, electric	**881,488**				
	Pollution - water	Not avail.				
	Pollution - waste	Not avail.				
	Pollution - IT (non-energy)	Not avail.				
	Pollution - paper (incl. library books)	Not avail.				
Location:	Opp. cost - resources used in transport		**7,266,078**			
	Pollution - transport	**480,635**				
	Effect of campus move on staff & students			Not avail.		
	Accessibility & social exclusion			Not avail.		
	Scale & agglomeration economies			Not avail.		
	Benefits of urban regeneration			Not avail.		
	Effect on staff & students of crime			Not avail.		
		-1,292,613	**2,420,042**	**570,407**	**98,052,288**	**68,694,910**

It should be noted that the construction phase impacts in Table 5.3b above are the same as those in Table 5.3a. The use and location phase impacts have been calculated as the difference between Campus C absolute impacts (Table 5.3a) and theoretical Campus A impacts (see Appendix B).

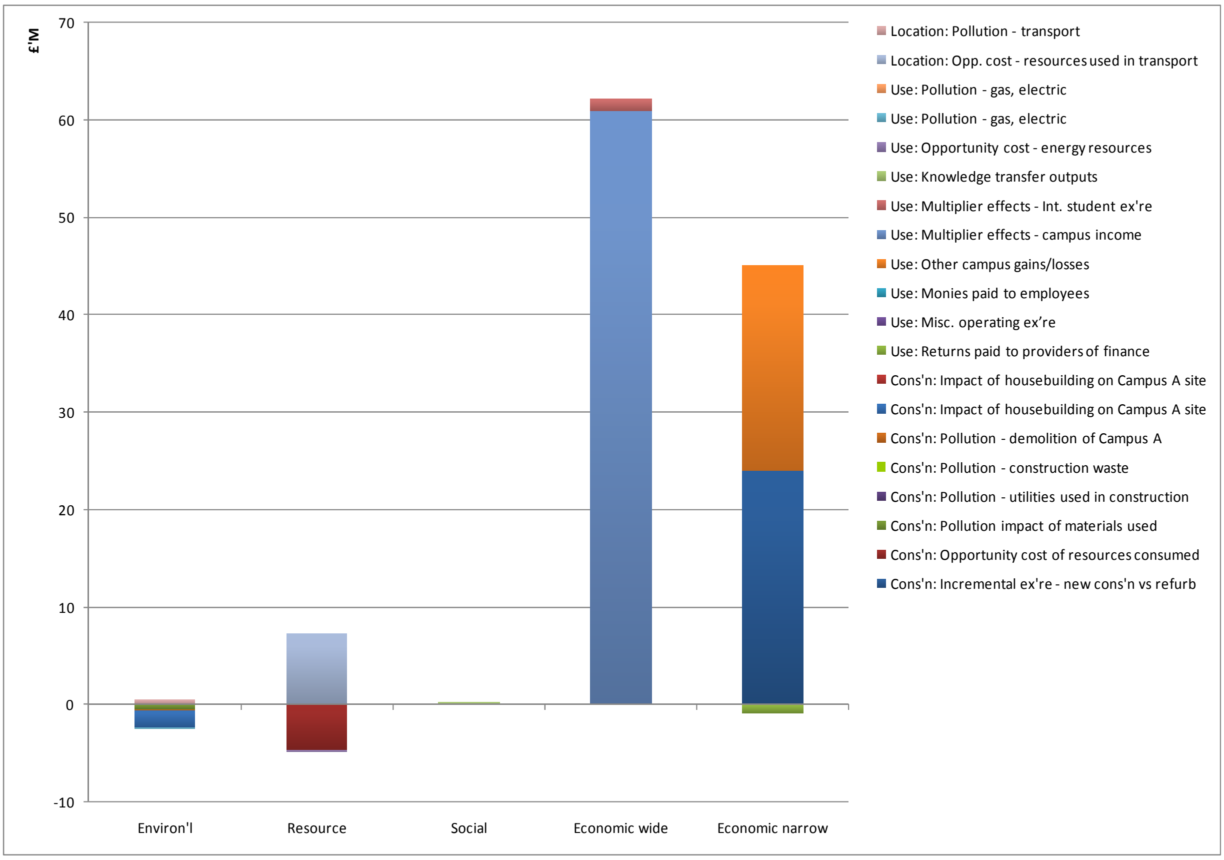
<u>Figure 5.3b</u> – Campus C incremental impacts (versus hypothetical Campus A impacts assuming no eco-refurb) – graphical (average social cost of carbon)



<u>Table 5.3c</u> – Campus C incremental impacts (versus hypothetical Campus A assuming eco-refurb; average social cost of carbon)

		Environ-mental (£)	Resource (£)	Social (£)	Economic (wide) (£)	Economic (narrow) (£)
Cons'n:	Incremental ex're - new cons'n vs refurb					**24,000,000**
	Multiplier effects - building ex're				Not applic'l	
	Opportunity cost of resources consumed		**-4,714,769**			
	Creation of infrastructure resources		Not avail.			
	Pollution impact of materials used	**-533,530**				
	Pollution - utilities used in construction	**-15,616**				
	Pollution - construction waste	**-439**				
	Pollution - demolition of Campus A	**-66,581**				
	Impact of housebuilding on Campus A site	**-1,695,080**				
Use:	Returns paid to providers of finance					**-919,419**
	Misc. operating ex're					**0**
	Monies paid to employees					**0**
	Other campus gains/losses					**21,077,901**
	Multiplier effects - campus income				**60,938,705**	
	Multiplier effects - Int. student ex're				**1,155,832**	
	Knowledge transfer outputs			**298,784**		
	Opportunity cost - energy resources		**-154,206**			
	Creation of intellectual capital		Not avail.			
	Pollution - gas, electric	**-48,280**				
	Pollution - water	Not avail.				
	Pollution - waste	Not avail.				
	Pollution - IT (non-energy)	Not avail.				
	Pollution - paper (incl. library books)	Not avail.				
Location:	Opp. cost - resources used in transport		**7,266,078**			
	Pollution - transport	**480,635**				
	Effect of campus move on staff & students			Not avail.		
	Accessibility & social exclusion			Not avail.		
	Scale & agglomeration economies			Not avail.		
	Benefits of urban regeneration			Not avail.		
	Effect on staff & students of crime			Not avail.		
		-1,878,891	**2,397,103**	**298,784**	**62,094,536**	**44,158,482**

Figure 5.3c – Campus C incremental impacts (versus hypothetical Campus A impacts assuming eco-refurb) – graphical (average social cost of carbon)



5.4 FCA detailed calculations – environmental impacts

Table 5.4 – Environmental impacts overview – Campus C vs Campus A.

	DRAFT 2:			DRAFT 1:	
	Campus C (£)	**Campus A (no refurb) (£)**	**Campus A (eco refurb) (£)**	**Campus C (£)**	**Campus A (no refurb) (£)**
Construction/renovation:					
Pollution impact of cons'n materials	**-618,163**	-	-	**-594,042**	-
Pollution impact of 'fit-out' materials	**-248,823**	-	-	Not avail.	-
Pollution impact of eco-refurb materials	-	-	**-333,456**	-	-
Pollution - utilities used in construction	**-25,376**	-	**-9,760**	**-11,532**	-
Pollution - construction waste	**-714**	-	**-274**	Not avail.	-
Pollution - demolition of Campus A	**-66,581**	-	-	Not avail.	-
Impact of housebuilding on Campus A site	**-1,695,080**	-	-	**-5,077,369**	-
Use:					
Educational impact - BREEAM rating	Not avail.	-	-	Not avail.	-
Pollution - maintenance materials	*Incl. in cons'n*	Not avail.	*Incl. in cons'n*	*Incl. in cons'n*	Not avail.
Pollution - gas, electric	**-280,722**	**-1,162,210**	**-232,442**	**-825,808**	**-1,162,210**
Pollution - water	Not avail.	**-18,273**	**-3,655**	Not avail.	Not avail.
Pollution - waste	Not avail.	Not avail.	Not avail.	Not avail.	Not avail.
Pollution - IT (non-energy)	Not avail.	Not avail.	Not avail.	Not avail.	Not avail.
Pollution - paper (incl. library books)	Not avail.	Not avail.	Not avail.	Not avail.	Not avail.
Location:					
Pollution - transport	**-7,861,906**	**-8,342,541**	**-8,342,541**	**-7,861,906**	**-8,342,541**
	-10,797,364	**-9,523,024**	**-8,922,128**	**-14,370,657**	**-9,504,751**

5.4.1 Campus C overview - activities converted to impacts and monetised

Per Table 5.4 eight out of thirteen activity categories were measured, converted to impacts and monetised for Campus C, and all were pollution related. The construction phase activities were construction materials used, fit-out materials used, utilities used and waste generated (all relating to Campus C), plus the demolition of Campus A and housebuilding on the Campus A site. Construction materials were further split into structural materials, material component units, floor finishes and exterior landscaping. Campus C use and location activities measured were gas/electric used and transport used respectively.

5.4.2 Activity base data

Base data on activities was gathered from a variety of sources. Tables B7 & B8 in Appendix B summarise the sources of data for the construction and use phases respectively, and Tables B14-B15 and B18-19 contain staff and student transport data (location).

The pre-build BREEAM assessment report provided data on quantities of completed material 'component units' used in construction, in the following sub-areas: external walls (timber cladding, brick, metal louvres, zinc cladding); roofing (Kalzip aluminium); upper floor terraces; concrete floor slabs; internal walls (plasterboard and masonary); floor finishes (porcelain tiles, dyed nylon carpet tiles and other); and exterior landscaping[97]. Quantities were expressed in m^2. Each 'component unit' was made up of a number of sub-components. For example, each m^2 of zinc cladding comprised of seamed zinc cladding, a geotextile layer, ply, timber counter battens, insulation, breather membrane, timber battens, a vapour control layer and plasterboard. The BREEAM assessment calculated how many m^2 of each type of 'component unit' was used in the building design. The quantity figures were corroborated with the building

[97] The BREEAM assessment conducted was based on 2006 BREEAM methodology which linked into the Third Edition of the Green Guide to Specification (Anderson et al. 2002).

contractor quantity surveyor, and he provided updated quantities where figures had changed since the BREEAM assessment had been undertaken. He also provided data on structural materials used, floor finishes/coverings and exterior hard landscaping materials (structural materials were excluded from the BREEAM assessment, and quantities for flooring and exterior landscaping were unclear).

Quantities for utilities used during construction (electricity, water and diesel) and waste produced were obtained from the building contractor environmental officer and extrapolated across the construction period. Energy used by Campus C ‘in use’ was based on estimated floor space.

Transport use data was obtained by conducting small-scale staff and student transport surveys to measure journeys to the existing Campus A and anticipated journeys to Campus C (data was gathered *before* the opening of Campus C, while Campus A was still in operation).

For staff, a survey measured the journeys of staff from one School Division. The survey gathered data on: current modes of transport (including car details if applicable - car type, engine size and year of registration); home postcode; average number of journeys made per week; and anticipated methods of transport when travelling to Campus C (including the use of a proposed ‘park and ride’ service). Distances currently travelled per staff member (to Campus A) and the distance that would be travelled to both Campus C and the proposed park and ride point were ascertained using journey planner software, and average distances to the three destinations were calculated. It was assumed that staff travelled to work on average four days a week, for 43.5 weeks a year. Staff travel preferences, average distances travelled per staff member, average car emissions and average number of journeys were then extrapolated across the 250 staff assumed to travel to Campus C, for the life-cycle period used in the calculations (20 years). For consistency, it was assumed that the same number travelled to Campus A. A separate calculation was undertaken to model the impact of the park and ride service based on estimated number of bus journeys per day, with distances calculated using journey planner software.

2,350 students were projected to use Campus C per the BREEAM assessment report. This total was split into 1,027 full-time students (43.71%) and 1,323 part-time students (56.29%), with the percentages based on current student numbers for the University as a whole (per the 2008 Annual Report). The journeys of part-time students were modelled by conducting another survey similar to that used for staff, for Year 4 of a professional accountancy programme. The data was extrapolated across the total anticipated number of part-time students. All full-time students were assumed to use public transport, attending 5 times per week for approximately 30 weeks per annum.

Transport survey results and calculations can be found in Appendix B, Tables B13-B21.

5.4.3 Conversion of activity data to impact data

Structural material data was converted into emissions data using factors from multiple academic and industry sources (see Table B10 in Appendix B), such as steel and concrete industry trade bodies (Worldsteel, 2009; British Cement Association, 2007 & 2008; Sustainable Concrete, 2009), and the University of Bath Inventory of Carbon & Energy (Hammond & Jones, 2008). Judgement was applied to choose the most reasonable figures. CO_2 was the only conversion factor available for steel. $SO_{2,}$, NO_x and particulates conversion factors were also available for concrete.

For material 'component units', the BREEAM methodology scores each component unit according to a number of weighted environmental criteria. Each unit is assessed according to its impact on climate change, water extraction, mineral resource extraction, stratospheric ozone depletion, human toxicity, ecotoxicity to fresh water, nuclear waste, ecotoxicity to land, waste disposal, fossil fuel depletion, eutrophication, photochemical ozone creation, and acidification (Anderson & Shiers, 2009). However, the data behind the scores (for example, say, the SO_2 emissions arising from the manufacture of $1m^2$ of zinc cladding) was not made publicly available by BREEAM, with the exception of component life cycle embodied CO_2 (and this was only made available in the Fourth Edition of the Green Guide). Therefore, only the embodied CO_2 impact of the Campus C material component units was able to be assessed for the purposes of the FCA calculations. Further, as the Campus C assessment was based on 2006 BREEAM methodology linked into the Third Edition of the Green Guide to Specification, the component units listed did not directly correlate to the categories in the Fourth Edition. An exercise had to be undertaken by the author to match, in the best way possible, slightly different descriptions of components between the campus assessment and the Fourth Edition. Floor finishes/coverings Green Guide CO_2 conversion factors could not however be located, so factors for linoleum/marmoleum, rubber flooring and carpet were derived from other literature - Hacker et al. (2008), Jonsson, Tillman & Svenson (1997) and Hammond & Jones (2008) (see Table B11 in Appendix B for more details). It was not possible to identify conversion factors for entrance matting, sprung timber flooring and vinyl flooring.

Internal fit-out material data was not available from the quantity surveyor when the first or second drafts of the calculations were attempted, as building fit-out was the subject of a separate contract that had not yet been agreed. Therefore, a number of assumptions were made to calculate an estimated figure. Firstly, it was assumed that embodied energy from building fit-out equated to approximately one half of that attributable to total construction (per Arnold (2004), services and finishes typically take up approximately one third of a chart depicting GJ/m^2 of initial embodied energy for office buildings, as opposed to the structure, envelope and other construction of the building). Secondly, it was assumed that the carbon impact of fit-out could be taken as one half of the carbon impact of construction. The carbon impact of construction (excluding flooring) was 7,841 tonnes; the estimated additional carbon impact of fit-out was therefore taken as 3,921 tonnes.

Construction utilities were converted into CO_2 impact data using DEFRA (2009) conversion factors. Construction waste data, provided in cubic metres, was converted to tonnes using WRAP (2009) conversion factors. The figures were then split between 'sent to landfill' and 'diverted' waste according to percentages provided by the environmental officer. CO_2 conversion factors for both types of waste stream were obtained from DEFRA (2009).

No activity data was available regarding the demolition of Campus A. One study was found (Athena Sustainable Materials Institute, Canada, 2009) that quoted the carbon impact per m^2 of an office building demolished and this was taken as a proxy.

Regarding the impact of housebuilding on the Campus A site, calculations were initially based on Sustainable Development Commission ('SDC') data. The SDC, in evidence given to the UK Parliamentary Select Committee on Environmental Audit (2008), stated that while studies on the environmental impact of building new homes were sparse it had been estimated that embodied CO_2 emissions ranged from 40 to 120 tonnes for each typical new house built. Further, it stated that this embodied construction CO_2 was likely to make up between 10%-30% of life-cycle emissions from homes. The initial calculations therefore assumed that: 200 homes would be built on the Campus A site (corroborated with the Director of Estates); the embodied CO_2 impact of constructing one new home would be an average of the figures available (80 tonnes); and that the additional life-cycle emissions per home (taking an average of 20%) would be 320 tonnes. A further study was then sought to triangulate these figures - carbon impacts arising from the construction, use and maintenance of average-sized 'medium-weight' homes were taken from Hacker et al. (2008). Assuming that the SDC figures used a lifecycle of 100 years, the carbon impact figures from the Hacker et al. study were virtually identical to the SDC figures, thus corroborating their reasonableness. Final calculations used the Hacker et al. figures, crucially only including impacts for use and maintenance over the first 20 years of the life of the houses (to tie in to the time period modelled for Campus C). Table B12 in Appendix B illustrates how the figures were derived from Hacker et al.

As noted above, 'in use' energy figure estimates were based on estimated floor space. The Building Emission Rate ('BER') of 18.3kg/CO_2/m^2 was taken from the BREEAM assessment and applied across this floor space figure and modelled campus life cycle (limited to 20 years as discussed earlier). It should be noted that the BREEAM assessment calculated the BER using energy software that modelled usage given the building type and individual room types (computer suites etc).

Separate figures for estimated electricity and gas usage taken from BREEAM working papers appeared to contradict the BER and translate into much higher carbon emission figures. The higher figures were initially used to be prudent. The sustainability consultant was then asked to confirm whether the separate figures were final or accurate, but did not do so. It was therefore decided to revert to the BER-generated figures on the premise that it would be unusual for a new building with a new boiler and many energy-saving features to be almost as damaging as a much older building of similar size (Campus A).[98]

For transport emissions, car emissions were ascertained using UK Government Vehicle Certification Agency (2009) data, and averages calculated. Emissions figures for staff and students utilising public transport options were based on a BREEAM assessment figure of 317.5 kg/CO_2 per staff member per annum, extrapolated across projected numbers of staff and students and the life cycle period. Park and ride emissions were based on DEFRA data.

[98] Post-completion of Campus C actual electricity usage figures have however exceeded those for Campus A (per the University environmental officer), which has surprised the University. This may be due to inefficient operation of the automatic lighting management system (once light sensors are triggered lights remain on for 20 minutes) or the need to run the mechanical cooling system for longer periods than anticipated due to the building retaining high internal temperatures.

As noted above, transport survey results and calculations can be found in Appendix B, Tables B13-B21.

5.4.4 Monetisation of impact data

Damage costs to convert impact data were mainly sourced from the limited number of existing studies that have applied FCA. Averages were taken where wide variations existed. See Table B9 in Appendix B for details. The largest pollutant in volume terms (carbon dioxide and/or carbon dioxide equivalents with global-warming potential such as methane) was valued by taking an average of 211 'social cost of carbon' ('SCC') figures[99] calculated by environmental economists between 1982 and 2006 and summarised in Tol's meta-analysis paper (£63.47/tonne; see Tol, 2008). Note that Tol's average cost was quoted in *dollars* ($105), so the sterling figure used (translated for the purposes of this study using the spot rate on 14th August 2009 of 1.6544) is subject to exchange rate fluctuations. Tol's average dollar damage cost still appears reasonable when benchmarked against recent debate on the subject. In a paper that argues that current US Government proposed guideline carbon prices ($21) are too low, Ackerman and Stanton (2010) cite the UK Government's latest estimated range of prices for carbon emissions (Department of Energy & Climate Change, 2009) of between £25 - £76 (equivalent dollar figures $41.36 - $125.73 using this author's translation rate) as being useful guide figures for US policy-making, even though the range is based on mitigation (abatement) costs rather than damage costs. It should also be noted that the Stern Review (Stern, 2006) calculated a SCC for 2006 of $85/tonne. If the highest social cost of carbon included in the Tol study had been used (£1,450.68/tonne) this would have generated total environmental costs of ***£234.8m***. The figure of £1,450 is clearly an outlier in the literature. However, as there remains significant uncertainty over the full effect of

[99] The UK Department of Energy & Climate Change (2009), for example, define the SCC as "estimates of the damage caused by emissions released into the atmosphere" (p.10) and, more precisely, "the marginal damage cost associated with an incremental emission of GHG, summed over its lifetime and discounted back to the year of emission" (p.13).

CO_2 emissions *and* the SCC, it serves as a useful illustration of the potential margin of error in the calculations.[100]

A decision was also taken not to explicitly discount (i.e., reduce) environmental costs, over and above any discounting that may have already occurred. This is consistent with past applications of the Sustainability Assessment Model ('SAM') (for example, see the rationale expressed in literature that discusses the SAM such as Baxter et al. 2002/2003/2004, and the views of Bebbington, Thomson & Barter (2009) that the time value of carbon is conceptually different to the time value of money). The damage associated with emitting one tonne of carbon dioxide now will be borne by future generations, and so it is not correct to discount the value of future emissions. Discounting environmental damage borne in the future incorrectly reduces its importance to today's decision-maker; this rails against the sustainability principle of inter-generational equity. Further, emissions in the future may be more harmful than those today if they push atmospheric concentrations closer to levels that constitute a 'tipping point' that will be catastrophic for the environment. It might therefore be argued that carbon should be *negatively* discounted (i.e., compounded) as time progresses, although the calculations undertaken here did not attempt to do this.

5.4.5 Calculations for Campus A – without eco-refurb

Figures for current electricity, gas and water consumption for Campus A were supplied by the University environmental officer and projected forward over a 20 year period. Consumption was converted to impact data using DEFRA conversion factors (DEFRA, 2009) and monetised. It was confirmed by the University environmental officer that a 'green' electricity tariff was being utilised for Campus A. However, this was not taken into account when converting as there is some debate about how 'green' such tariffs are and whether they lead to

[100] It should also be noted that FCA applications published after this study was undertaken have used similar carbon costs. Mattison et al. (2011) used a figure of £51.38 and PUMA (2011) used a figure of £52.59. Only Epstein et al. (2011) used a much lower figure (£18.13).

real carbon reductions. It was therefore assumed in using the DEFRA factors that electricity has been generated according to average available methods. Transport impact figures were based on the surveys described above and were monetised in the same way as the Campus C figures.

5.4.6 Calculations for Campus A – with eco-refurb

In the absence of any available quotes or plans to undertake a significant eco-refurbishment of Campus A, the damage associated with a theoretical refurbishment was simply calculated by pro-rata'ing down the damage costs calculated for Campus C construction (materials, utilities, and waste) based on an estimated cost of refurbishment (£15m) versus the cost of constructing Campus C (£39m). The cost of refurbishment was very much a 'guesstimate'.

Utilities figures were calculated as 20% of the Campus A figures without refurb, as it was assumed that a refurbished campus would only use 20% of the energy and water of the pre-refurbished building. This assumption was formed based on studies by Cole & Kernan (1996) and Power (2008). Cole and Kernan studied life cycle energy usage in office buildings, and concluded that current buildings could reduce their operating energy usage by 75% in future. Further, Power (2008) cited various energy reduction programmes in Germany that had achieved an average 80% reduction in energy usage (based on data from over 7,000 homes).

5.4.7 Limitations/issues with data

The following issues were noted when conducting the environmental calculations. Firstly, the calculations attempted to 'piggy-back' on the BREEAM assessment of Campus C and utilise its data, particularly in relation to material usage during the construction of the campus, energy usage during the use phase of the building, and the predicted transport emissions generated by staff and students. However, the BREEAM methodology was found to contain a number of flaws and gave an incomplete picture of environmental impacts.[101] Namely:

(i) The BREEAM assessment did not consider the structural materials used in the foundations and frame of the building, even though these constituted a large proportion of total material usage (this was confirmed by reviewing the BREEAM assessment categories in conjunction with the quantity surveyor). The fourth edition of the Green Guide to Specification states that "substructure and superstructure (vertical supporting structure of the building) elements have not been included within this fourth edition as it has not been possible to provide either representative functional units for these elements, or comparable specifications" (Anderson & Shiers, 2009). Therefore, significant tonnages of steel and concrete – that had significant environmental impacts – were ignored. Including these items in the BREEAM assessment might have allowed the opportunity to debate the merits of, for example, using concrete with recycled content that reduces environmental impact (such as GGBS[102]). As noted above, data on the quantities of materials used in the structure of the building was therefore obtained from the building contractor quantity surveyor, and the carbon dioxide (and other emissions) arising from the manufacture of the materials were identified using concrete industry and academic study data[103].

(ii) Project group participants noted that BREEAM boundary assumptions were over-simplistic in certain cases and would have understated environmental impacts. For example, the underside roof cladding of Campus C was made of Canadian cedar wood. However, the BREEAM assessment only scored transport environmental impact based on how far the finished building

[101] It should be clearly noted that this thesis is NOT calling into question the 'BREEAM Excellent' rating awarded to the design of Campus C. It is simply noting that the methodology utilised by the BREEAM assessment process (as stipulated by BREEAM) does not consider certain variables, and/or makes over-simplistic assumptions.

[102] 'GGBS' = ground granulated blast-furnace slag.

[103] Damage costs associated with steel and concrete used in construction totalled £302k, being 49% of total construction material damage costs.

product had travelled. While the raw material may have travelled thousands of miles to a local factory, BREEAM would only have picked up the impact of transporting the roof cladding from the factory to the building site.

(iii) It proved difficult to match BREEAM material 'component units' to CO_2 impact data in some instances given that the BREEAM assessment had been based on the Third Edition of the Green Guide but that CO_2 data was only available in the Fourth Edition. This therefore either meant that units had to be chosen that appeared similar to those in the BREAAM assessment (which carried the risk of mismatching error), or other sources had to be used to obtain impacts (this was required for flooring categories). Indeed, it was not possible to obtain any data for metal louvres or some flooring categories. It was also not possible to obtain data from BREEAM on impacts apart from CO_2. The environmental impacts calculated for component units were therefore significantly understated. Understatement is illustrated by the fact that the Green Guide only gives the climate change impact of materials a 21.6% weighting in comparison to total impacts considered (climate change, water extraction, mineral resource extraction, stratospheric ozone depletion, human toxicity, ecotoxicity to fresh water, nuclear waste, ecotoxicity to land, waste disposal, fossil fuel depletion, eutrophication, photochemical ozone creation, and acidification). However, this understatement might have been offset to a small extent by the difference in the length of time that impacts were measured for, as discussed in the paragraph below (project as a whole 20 years vs impact of material components 60 years).

(iv) The assessment did not attempt to model water usage or waste production. While BREEAM rated the water efficiency of appliances it did not project usage.

(v) The assumptions in the BREEAM methodology regarding people's transport method behaviour were over-simplistic and understated the pollution and resource use impact of travel to and from the building. Separate transport surveys were therefore required. The BREEAM assessment of Campus C calculated emissions per staff member of 317.5kg/CO_2 per annum, given its urban location and the assumption that all staff would use public transport for all journeys. This could be considered wholly unrealistic. A similar amount of CO_2 would be emitted in approximately two return journeys made by an average staff member living 20km away driving an average family car. The staff and student transport surveys noted above (and detailed in Appendix A) found that 71% of staff and 59% of students still intended to drive to Campus C.

Secondly, the FCA calculations modelled the sustainability impacts of Campus C over 20 years. However, the BREEAM assessment measured the life-cycle impact of the material component units over a 60 year period (including replacement materials where relevant). No attempt was made to pro-rata down the CO_2 impact figures extracted from BREEAM as it was assumed that the majority of the impacts were incurred during the extraction of raw materials, the manufacture of the units and the fitting process. Further, the damage costs relating to total material component unit impacts were calculated as £209k. Given that the damage associated with total environmental construction impacts was calculated as £2.7m, any overestimation was likely to have had a small effect on the total position.

Thirdly, obtaining conversion factors for 'lower volume' pollutants (such as SO_2, and NO_x) proved problematic. Tables B7 & B8 in Appendix B illustrate that conversion factors for these pollutants were only available for eight of the fifty impact lines identified. Indeed, it was generally difficult to source conversion factors per se – a lot of time was spent reviewing many different literature threads, often with little reward.

Fourthly, large variations were found in the damage costs available[104] (which were mainly sourced from the limited number of existing studies that have applied FCA). Averages were taken where wide variations existed.

Fifth, some calculations were based on a very limited number of proxy studies – the impact of fitting out the new campus, demolishing Campus A and using the Campus A site for house building. The study would have benefitted from tailored, case-specific research to inform these measures. A good example of this was the impact on the biodiversity of the Campus A site caused by demolition and the building of new homes. This was not measured; a rudimentary CO_2 proxy impact figure was used instead. However, measuring specific biodiversity impacts may have yielded significant figures. Suggestions on how this area could be taken forward are discussed in (the concluding) Chapter 7.

Sixth, it was hoped that wider transport surveys could be conducted when undertaking the Draft 2 calculations (the surveys conducted at the Draft 1 stage were small and it would have been useful to corroborate their results). However, there was not scope available to undertake more work in this area.

Finally, the Campus C energy usage figure differed significantly depending on which data was used from the BREEAM report (different information was contradictory; the lower information set was used). Given that the electricity usage of the Campus was much higher than expected once it became operational, it is likely that the figures calculated were understated.

5.4.8 Items identified that could not be monetised

In addition to the issues noted above regarding the problems of converting some sub-activities into impacts and the lack of conversion factors for 'lower volume' pollutants, there were also instances where entire categories could not be

[104] See earlier discussion on the social cost of carbon

monetised, either due to a lack of activity data, or appropriate impact or monetisation conversion factors.

Table 5.4 shows that it was not possible for the use stage of Campus C to monetise the pollution impacts caused by: consuming water; producing waste; and purchasing short life electronic assets (such as computers and printers) and paper (including library books). This lack of data also applied to the theoretical continuation of Campus A, with the exception of water consumption. It was also not possible to measure the educational impact of the BREEAM rating[105]. Water usage and waste figures were not available as the University had not modelled them for Campus C and BREEAM had not either. Data was not available on separated current waste streams for Campus A. The purchase of electronic assets and paper were not modelled due to time constraints and the fact that initial literature searches did not identify impact conversion factors.

5.4.9 Evolution of calculations

Some significant alterations/additions occurred between Drafts 1 and 2, and this illustrates the value of running two LFA cycles, each involving a project group meeting with subsequent calculations. Firstly, whole new categories were monetised in the Draft 2 calculations, namely: Campus A eco-refurb figures; impact of fit-out materials; waste impacts from Campus C construction; and the impact of demolishing Campus A. These impacts were included as more data became available and/or calculations were refined. Further, the calculations for almost all other categories were refined. For example: steel damage costs fell due to the use of a lower steel CO_2 emission factor (based on a wider sample of emission factors); updated (and extended) material component unit figures were obtained from the quantity surveyor), and new conversion factors were found; more up-to-date utilities figures for the construction period were obtained; a

[105] However, note discussions above regarding the flaws of BREEAM as a holistic environmental measure, and conclusions drawn elsewhere in this thesis that such a limited measure (from both an environmental and a sustainability perspective) could cause more harm than good.

second study on the impact of house building adjusted initial figures; and energy in use figures were adjusted due to uncertainty.

5.4.10 Conclusions

Stand-alone Campus C

As noted at the beginning of this Section and illustrated in Table 5.4, eight out of thirteen activity categories were measured, converted to impacts and monetised for Campus C 'standing alone' – a conversion rate of 62% which could be viewed as a reasonable success. Further, there was clear evidence of the evolution of calculations. Monetisation produced a negative environmental impact of £10.8m, a relatively small value that only accounted for 2% of the total of positive and negative monetary values generated for Campus C (£659.7m, a figure obtained by summing totals in Table 5.3a). However, in addition to certain use categories missing completely, some items in certain sub-categories could not be converted into impacts (construction materials - metal louvres, flooring) or, as was the case with the vast majority of impacts, only CO_2 impact data was available[106]. *The figures calculated are therefore likely to be significantly understated*. It was also noted above that rudimentary proxy measures were utilised in some cases, which could have over or understated the position in this specific case study.

While bearing in mind the shortcomings above, the distribution of costs was as follows (for the stand-alone calculations). Direct construction impacts of £893k (excluding the costs of demolishing the old campus and reusing the land for house building) accounted for only 8% of total costs. The demolition and reuse costs for Campus A (£1,762k) represented 16% of total costs. The impact of running the new campus for 20 years (£281k) represented only 3% of the total. Therefore, the most significant stand-alone impact of the new campus was calculated as being caused by staff and students travelling to use it – damage

[106] It was noted in relation to material component units that climate change impacts only represented 21.6% of total environmental impacts

costs arising from transport (£7,862k) were estimated to account for 73% of total costs. It could hence be concluded that even if construction impacts are likely to be understated, and some use impacts are missing, the costs are so skewed towards transport that it is unlikely that they would be overtaken by the other categories in a more nuanced set of calculations.

Incremental Campus C

When Campus A theoretical impacts (assuming no eco-refurbishment) were deducted from Campus C impacts to calculate incremental impacts, Campus C exhibited environmental gains from usage (and due to its location) due to modelled changes in energy consumption and transport habits. However, these were cancelled out by the negative environmental impacts of building the campus, demolishing Campus A and redeveloping the sold Campus A site for housing. Given the usage and location gains, if the calculations were ‘ran’ over a longer period given the same data, they would eventually become positive overall.

When Campus A theoretical impacts assuming an eco-refurbishment were deducted from Campus C impacts to calculate incremental impacts, overall environmental losses were, somewhat paradoxically, greater than those under the ‘no eco-refurbishment’ scenario. This was due to an assumption that Campus A pollution impacts from gas and electricity usage could be cut by 80% if an eco-refurb took place, which led to the existing campus exhibiting lower impacts than Campus C.

5.5 FCA detailed calculations – resource impacts

<u>Table 5.5</u> – The opportunity cost of resources consumed, Campus C vs Campus A.

	DRAFT 2:			DRAFT 1:	
	Campus C (£)	**Campus A (no refurb) (£)**	**Campus A (eco refurb) (£)**	**Campus C (£)**	**Campus A (no refurb) (£)**
Construction/refurb:					
Opportunity cost of resources consumed	**-7,661,500**	**-**	**-2,946,731**	**-28,000,000**	**-**
Creation of infrastructure resources	Not avail.	-	-	Not avail.	-
Use:					
Opportunity cost - energy resources	**-896,623**	**-3,712,087**	**-742,417**	**-2,554,925**	**-3,712,087**
Creation of intellectual capital	Not avail.	Not avail.	Not avail.	Not avail.	Not avail.
Opportunity cost - maint'ce materials	Not avail.	Not avail.	Not avail.	Not avail.	Not avail.
Location:					
Opp. cost - resources used in transport	**-45,101,542**	**-52,367,620**	**-52,367,620**	**-45,101,542**	**-52,367,620**
	-53,659,665	**-56,079,707**	**-56,056,768**	**-75,656,467**	**-56,079,707**

5.5.1 *Opportunity cost of resources consumed (Campus C)*

The impact of consuming non-renewable resources during the construction and use phases of Campus C (essentially, the opportunity cost of those resources not being available to future generations) was calculated using estimated amounts paid for construction materials, energy, and transport fuel.

When Draft 1 of the FCA calculations were produced, the cost of construction materials and energy was estimated by applying the building contractor's cost of sales percentage of 80% of revenue (adjusted downwards to exclude wages and salaries, and extracted from their 2008 Annual Report) to the total Campus C cost of £35m. The Draft 2 figures were reduced for two reasons. Firstly, it was possible to split down the total construction cost to extract the direct construction expenditure – therefore, £28m was used in the calculations instead of £35m. Secondly, it was acknowledged that a significant proportion of construction materials were recyclable at the end of their lives. This proportion was calculated as 65.8%, based on data available in the Fourth Edition of the Green Guide to Specification (Anderson & Shiers, 2009) and the cost figure was reduced by this amount.[107]

The cost of energy usage over the life of Campus C was estimated in the Draft 1 calculations by applying the 2008 cost per KWh of Campus A electricity and gas to the estimated Campus C lifetime electricity and gas consumption figures. However, as noted above, the accuracy of the Campus C estimated consumption figures was called into question – they appeared to be too large. Therefore, for Draft 2, a revised calculation was made of Campus C energy costs. Costs were calculated by pro-rata'ing down Campus A costs by a factor based on Campus C annual CO_2 emissions from energy (calculated using the BREEAM Building Emission Rate) as compared to Campus A CO_2 emissions (based on actual consumption). The Draft 2 figure was lower as a result.[108]

[107] These amendments were suggested by U9 in the second project group meeting
[108] Note however the discussion in Section 5.4; the revised, lower energy figure may have been misstated.

No data was available to estimate maintenance costs over the forecast period.

The cost of staff and student car transport fuel over the Campus C life cycle was calculated by applying a price of £1.05 per litre of fuel (based on average costs at the date of the Draft 1 calculations) to an estimate of total litres consumed - which was 'worked backwards' from estimated CO_2 emissions figures (calculated as explained in Section 5.4) using DEFRA conversion factors (DEFRA, 2009). No adjustments were made between Drafts 1 and 2.

5.5.2 Campus A comparison figures

The resource cost of energy and water usage for Campus A assuming no eco-refurb was calculated by applying the 2008 costs per KWh etc over a 20-year period. Staff and student car transport fuel costs were calculated in the same way as for Campus C above, using the questionnaire base data from Section 5.4. Resource savings were present when the overall Draft 2 Campus C figures were compared to Campus A; this was a significant shift compared to Draft 1.

The resource cost of energy and water usage for Campus A under a theoretical eco-refurb was calculated as 20% of the Campus A figures without eco-refurb (see Section 5.4 for an explanation).

No data was available to estimate maintenance costs over the forecast period under either hypothetical scenario.

5.5.3 Creation of infrastructure resources and intellectual capital

Neither of these impacts were calculated at Draft 1; the creation of infrastructure resources was not investigated due to time constraints preventing the interviewing of City council officials and the searching of the literature, and it was decided at the first project group meeting not to attempt to calculate the creation of intellectual capital at that stage. At Draft 2, time constraints further inhibited work, and attention was also transferred to the calculation of 'knowledge transfer outputs'. (These were included as *social* benefits – see next section.)

5.5.4 Conclusions

The opportunity cost of resources consumed was significant, representing (for example, for stand-alone Campus C) 83% of total negative costs (environmental plus resource) and 8% of total monetised amounts across all categories (positive and negative). Further, as in the environmental category, the largest costs were generated by staff and students travelling to use the campus. Incrementally, Campus C exhibited resource 'gains' due to the modelled changes in energy consumption and transport habits. As with the environmental calculations, there was clear evidence of the evolution of calculations through the two LFA cycles.

However, the method used to calculate these costs – prices paid to purchase the resources – could be regarded as extremely blunt. While this was the method used in the BP SAM application (the opportunity cost of extracting and using non-renewable oil was based on its value), paradoxically it suffers from the problem of using prices that are generated by an economic system that has been criticised for getting its prices wrong (see detailed discussions in Chapter 2). It could be argued that society might undervalue its scarce resources when selling them as it does not factor in the future unavailability of such resources. Further, prices are dependent on current market values, which are volatile (at the time of writing these conclusions, in May 2013, fuel prices stand on average 30% higher than the 2009 prices used in the calculations). The calculations did not attempt to factor in price inflation/deflation over the forecast period or to positively or negatively discount the figures over time. Finally, as noted above, maintenance resources were not measured. One could therefore conclude that the measure was useful in that it highlighted resource issues, but that the value was open to significant challenge.

It would also have been useful to counterbalance the negative resource costs calculated with positive costs attributable to the creation of infrastructure resources and the creation of intellectual capital. The building of Campus C was part of a larger project to renovate the waterfront of the City along the riverbank (as noted in chapter 3), and this may have not occurred to the same extent had the campus not been built. Further, one could anticipate multiple levels of intellectual capital being created by the University. While a small amount might be monetised by the marketplace already (note the figures in the next section regarding royalties arising from intellectual property rights), one could argue that a large proportion would not be – for example, the knowledge and skills gained by students that they would use in their careers for their own benefit and for the benefit of their employing organisations. The value of this education might be significantly different to the fees paid to obtain the education (which are captured in the 'economic narrow' category[109]). To home in on one relevant area as an example, U6 raised the point during the interview process that educating students about sustainability might have a very impact on future society.

[109] And which are set based on a Wales Government policy of subsidisation rather than the market

5.6 FCA detailed calculations – social impacts

Table 5.6 – Knowledge transfer outputs (Campus C vs Campus A):

	DRAFT 2:			DRAFT 1:	
	Campus C (£)	**Campus A (no refurb) (£)**	**Campus A (eco refurb) (£)**	**Campus C (£)**	**Campus A (no refurb) (£)**
Use:					
Provision of social facilities	partial	-	-	Not avail.	-
Indirect education benefits	Not avail.	-	-	Not avail.	-
Knowledge transfer outputs	**2,517,569**	**1,947,162**	**2,218,786**	Not avail.	Not avail.
Location:					
Effect of campus move on staff & students	Not avail.	-	-	Not avail.	-
Accessibility & social exclusion	Not avail.	-	-	Not avail.	-
Scale & agglomeration economies	Not avail.	-	-	Not avail.	-
Benefits of urban regeneration	Not avail.	-	-	Not avail.	-
Effect on staff & students of crime	Not avail.	-	-	**-4,966,198**	-
	2,517,569	**1,947,162**	**2,218,786**	**-4,966,198**	**-**

5.6.1 Knowledge transfer outputs

A new category was calculated at Draft 2 utilising data from an existing body of research[110]. Kelly et al. (for example, see Kelly et al. 2005, Kelly & McNicoll 2008 and Kelly et al. 2008) have undertaken a pilot 'proof of concept' study that has sought to place a monetary value on some of the annual knowledge transfer outputs of 19 Scottish universities, as part of a significant ESRC-funded project that has sought to determine the varied wider impacts of higher education institutions ('HEI's') on regional economies. Non-market (i.e., generally free at point of delivery) outputs have been analysed, but only in the areas of community engagement, cultural outreach and public policy advisory activity (Kelly et al., 2008). These are distinct from market outputs that can be measured in conventional economic terms, such as patents or consultancy contracts awarded.[111] The outputs identified (events open to the public, performances open to the public, external sports facilities usage, external library resource usage, and public policy involvement) have been those that: (a) are in addition to core teaching, research and commercial consulting activities; (b) should reach or involve people beyond the boundaries of the institution; and (c) should reach or involve non-academic audiences. Shadow pricing has been used to attach monetary values to activities. For example, time spent by attendees at events held at the institution/using institution resources has been costed using a 'time-cost' method (utilising Department for Transport estimates of per-hour 'non-working' time), whereas time spent by academic staff on public policy advisory work has been costed based on commercial consultancy rates ('parallel market' rates).

The knowledge transfer outputs of University X were calculated as follows. The value placed on the outputs of the 19 Scottish institutions, £30.8m per annum, was pro-rata'ed based on the revenue of University X as compared to the

[110] As noted in previous Sections, this again illustrates the evolution of calculations.
[111] Incidentally, Kelly et al. (2009) have noted that market-based outputs from UK Universities as a whole are *relatively* small; income attributable to royalties arising from intellectual property rights represents only £37m, and income from consultancy represents £335m (for all UK universities per annum).

revenue of the Scottish institutions (data on comparative revenues for 2008/09 was obtained from the Higher Education Statistics Agency ('HESA') – see HESA, 2009). Therefore, the annual knowledge transfer output of University X was priced at £551k.

The knowledge transfer value applicable to Campus C over a 20 year period was calculated as £2,518k. It was assumed that the campus would generate 25% of total University X knowledge transfer values, simply based on its proportion of total University revenue (for income/revenue discussions see Section 5.7). The annual value was assumed to increase by 5.9% per annum, again modelled on anticipated revenue growth. Projections over a 20 year period were discounted back to present value using the same discount rate as applied to revenue and expense projections. Knowledge transfer values were similarly calculated for Campus A with or without eco-refurb over the same period (£2,219k and £1,947k respectively), with growth rates based on estimated income growth rates for these scenarios.

The figures calculated must be seen as an illustration that is likely to be significantly understated. It has been recognised by Kelly et al. that their study is only a pilot study; it does not capture all knowledge transfer areas or outputs. The same can therefore be said of the figure calculated for University X. Were data to be specifically gathered for University X in the future, it might be sensible to include additional categories where services are currently provided for no charge or for nominal charges, such as:

- Engagement with learned societies, professional bodies, trade organisations etc (for example: provision of CPD lectures/events; advising professional bodies on assessment; advising other universities on quality and assessment (external examiner or validation work); dissemination of research (for example at symposia); and the contribution of articles to trade journals / professional body journals etc);

- Goodwill of academics (average overtime hours worked);
- Other engagement with society at large (for example media comment in newspapers, TV, radio, on-line blogs and/or messages via social media); and
- Articles downloaded from the institutional repository.

Further, it might be the case that the city centre accessibility and visibility of Campus C (which might more easily allow knowledge transfer) has not been fully measured in the differential growth rates discussed above. Since the Campus opened in 2011, it has been used almost continuously by a large number of outside organisations for events and meetings and as such is likely to have increased interaction between academics and outside organisations (note that the level of interaction has not been formally measured).

5.6.2 Benefits of urban regeneration and other impacts

Discussions were held with an officer of the local urban regeneration company[112] to try and ascertain the ‘wide economic’ and ‘social’ benefits of the Campus C development proceeding amid the halting of many other regeneration developments in the area due to the recessionary climate (the new campus was part of wider regeneration of city). However, while the continuation of the campus project in the face of economic difficulties was seen as an important signal and confidence builder, the urban regeneration company were unable to provide any monetary estimates of the impact on the local economy of investing to bring the University into the City centre. Further, U9 noted in the second project group meeting that organisations were now interested in talking to the University given that it was moving to the City centre – for example the library, gyms, and the bus company – and that students would have an impact on local shops, cafes and bars. However, it was not possible to obtain any estimates of this impact.

[112] The company is a partnership between the Welsh Assembly Government and the City Council, created to regenerate the City. It has provided part of the grant funding for Campus C.

The FCA calculations were also not able to consider the impact of: the indirect educational benefits of Campus C; the Campus C social facilities; the campus move on staff and students; Campus C on accessibility and social exclusion; and the generation of scale and agglomeration economies by moving to the city centre.

After the first project group meeting, it was recognised that measuring the indirect educational benefits of Campus C and the benefits of its social facilities would not be possible at Draft 1; after the second meeting it was deemed that measurement was unlikely at all. (The provision of social facilities at Campus C - in particular, a cafe and exhibition space open to the public - would however have been partially, indirectly measured via the knowledge transfer figure in Section 5.6.1 above.) Prospects were deemed more hopeful after the first meeting for the remaining impacts listed above – it was expected that all of them *could* be measured. However, more time than anticipated was spent during the Draft 1 calculations working on the environmental impacts, which left less time to tackle resource and social impacts. Also, activity data for the social impacts could not be easily modelled or obtained. By the time of the second project group meeting it was therefore recognised that it would be unlikely that the impact of Campus C on accessibility and social exclusion and the generation of scale and agglomeration economies by moving to the city centre would be measureable, although it was still hoped that the effects of the campus move on staff and students could be modelled. This was ultimately not possible at Draft 2 as gathering data on such a sensitive issue was felt to be too difficult given the negative strength of feeling that the impending move was generating amongst staff.

In conclusion, if it had been possible to measure these areas, they may have generated significant impacts. (It could be argued that the majority of these impacts should have been modelled and made available by local government authorities.)

5.6.3 Effect on staff and students of crime

The potential cost of crime against University staff and students was modelled at in the Draft 1 calculations and is detailed below. However, when the project group met to discuss the Draft 1 figures it was felt that this was a figure too complex to model (given the many competing effects that could influence crime). Therefore, the Draft 1 calculations were not included in the final Draft 2 summaries.

The Draft 1 figures were modelled as follows. Crime figures per 1,000 of the population in the University City per type of crime were obtained from latest Home Office statistics (see Home Office, 2009). These figures were translated into the probability of crimes occurring, and the probability percentages were applied to the number of staff and students projected to use Campus C to give an estimated number of crimes committed per annum. Average damage costs per crime type (again, per Home Office figures; see Home Office, 2005) were applied to the projected number of crimes committed, and this was extrapolated over a 20 year period. The figures are given in Table B22 in Appendix B.

It was recognised at the Draft 1 stage that these figures could well be overstated; they did not take into account the positive effect that Campus C might have on reducing crime in the city centre, especially as it was intended to provide a social space for the general public (as noted above) in addition to providing a large influx of staff and students. It should also be noted that it was a limitation of the analysis that no attempt was made to calculate the realistic incremental increase or decrease in crime levels in moving from Campus A to Campus C. It was assumed that the impact of crime at Campus A was zero. While Campus A could be considered safer than the city centre, this was a very simplistic assumption. If avoidance or restoration costs had been calculated, it may have been possible to calculate the costs of staff/students avoiding damage from crime in the city centre (for example, the cost of ‘safe’ transport, the provision of personal alarms, and self-defence training).

5.7 FCA detailed calculations - ‘narrow’ economic impacts

Table 5.7 – Narrow economic impacts, Campus C vs Campus A.

	DRAFT 2:			DRAFT 1:	
	Campus C (£)	Campus A (no refurb) (£)	Campus A (eco refurb) (£)	Campus C (£)	Campus A (no refurb) (£)
Construction/renovation:					
Direct construction ex're	**28,000,000**	-	-	**35,000,000**	-
Theoretical refurb ex're	-	-	**15,000,000**	-	-
Other monies paid to contractors etc	**7,000,000**	-	-	-	-
Misc. project expenditure	**4,000,000**	-	-	**4,000,000**	-
Ex're required to achieve BREEAM rating	Not avail.	-	-	Not avail.	-
Cost of University management time	Not avail.	-	-	Not avail.	-
Use:					
Returns paid to providers of finance	**8,881,058**	**3,408,862**	**9,800,478**	**9,832,440**	**3,774,036**
Misc. operating ex’re	**74,083,037**	**74,083,037**	**74,083,037**	**82,019,171**	**82,019,171**
Maintenance costs and utilities	Not avail.	Not avail.	Not avail.	Not avail.	Not avail.
Training and staff devt ex're	Not avail.	Not avail.	Not avail.	Not avail.	Not avail.
Monies paid to employees	**126,784,276**	**126,784,276**	**126,784,276**	**140,366,021**	**140,366,021**
Other campus gains/losses	**-4,161,453**	**-28,384,165**	**-25,239,353**	**562,828**	**-31,424,815**
Total income	**244,586,919**	**175,892,009**	**200,428,437**	**271,780,460**	**194,734,413**

This category seeks to model the traditional economic impact of a project – its income and expenditure as measured in accounting terms in the financial statements. However, importantly, the FCA for HE analysis does not present the accounting numbers as income less expenditure (which is the usual format for a 'profit and loss account', or 'income statement'[113]). Instead, projected income is analysed according to who it is distributed to (i.e., the stakeholders who receive the benefit) – employees, service suppliers, providers of finance etc.

The calculations attempted to model the income of Campus C over a twenty year period (discounted to present value) and split it between the various stakeholders. Theoretical figures were also modelled for the continuation of Campus A.

5.7.1 Stand-alone Campus C figures

Twenty-year projections for University income[114] and expenditure categories related to use of the campus (with the exception of returns paid to providers of finance) were constructed by: calculating average growth rates using actual financial statement data for the periods 2005-2008 and University forecast data for the periods 2009-2012 (see Table B23 in Appendix B); pro-rata'ing down the relevant categories in the 2012 financial projections by a factor based on the anticipated Campus C student headcount as compared to total University students[115], to generate a proxy for amounts generated by Campus C; and applying the average growth rates calculated compound to the pro-rata'ed numbers. Grant income received to build the new campus and sales proceeds from the sale of Campus A were also factored into income projections. To project returns to providers of finance, projected loan balances as at 2012 (per

[113] The 'income statement' is the International Accounting Standards Board term for a profit and loss account
[114] Excluding endowments and interest income
[115] Total students 2007/08 = 9,499 (per 2008 Annual Report). Projected students for new campus = 2,350 (per BREEAM assessment). Campus C % of students = 2,350/9,499 = 25%. Therefore assumed that Campus C annual income/expenditure = 25% x total University income/expenditure.

University forecasts) and onwards were reduced by anticipated capital repayments and interest charges calculated based on current University borrowing costs of 5.22%. It was not possible during either the Draft 1 or Draft 2 calculations to extract the sub-categories ‘maintenance costs and utilities’ and ‘training and staff development expenditure’ from the ‘miscellaneous operating expenditure’ category. This was due to a lack of information in University forecasts, and the non-participation in the FCA project of the University Finance Director (despite an invite).

Construction expenditure figures were based on the publicly quoted project value of £35m, plus additional miscellaneous project expenditure of £4m as derived from University forecasts (this expenditure was only identified after the first project group meeting on review of forecasts). In the Draft 2 calculations, the figure of £35m was split down into monies paid to the building contractor (£28m) plus other monies paid to contractors and professionals (£7m).

Once calculated, income and expenditure streams were discounted to present value, and the category ‘other campus gains/losses’ was calculated as a balancing figure between projected income (£271,780,460 Draft 1; £244,586,919 Draft 2) and projected expenditure. The rate of 5.22% quoted above was utilised as the University cost of capital, as it was assumed that the cost of debt equated to the weighted average cost of capital in the absence of shareholders. Differences between Draft 1 and Draft 2 figures were due to calculations being reviewed and greater accuracy being applied - for example, grant income was discounted at Draft 2 (this had been overlooked at Draft 1), and income and expenses in general were subject to more accurate discounting that took into account variations in receipt or expenditure dates in the early years of the project.

After the first project group meeting, it was hoped that the presumed extra expenditure required to achieve a BREEAM Excellent rating for Campus C and the cost of University management time devoted to achieving BREEAM could be

presented separately. However, the author found that it was not possible to obtain this data and so measurement was dropped for Draft 2.
During the Draft 2 calculations, more work was undertaken to consider the positive effect of the new campus on recruitment[116]. A review of the literature was undertaken to find studies that have estimated the effect of new buildings on income growth. A Commission for Architecture and the Built Environment report, 'Design with Distinction: The Value of Good Building Design in Higher Education' (CABE, 2005), was the only relevant study found. The study undertook research on new campus buildings at 5 HEI's (four in England and one in Wales). Data was obtained from staff and students at the institutions on the effects of the new buildings on recruitment, retention and performance (the data was gathered from qualitative interviews, focus groups, and surveys). The study, not surprisingly, showed that new buildings had a positive effect on the recruitment of students – 63% of undergraduate students and 72% of postgraduate students stated that the quality of new buildings positively affected their choice of university. However, the study did not produce factors by which growth projections could be inflated.

The possibility was also raised in the project group discussions of the Draft 1 figures that Campus C would attract a higher proportion of International students. The fee income of University X from non-EU students had grown by an average of 36% between 2004/05 and 2008/09 (Annual Reports, 04/05 – 08/09); however, it was not possible to model a change in the home/International student mix (and any consequent alterations to income) as the University Finance team were not involved in the calculations.

Finally, at the second project group meeting, a request was made to model the benefits of proceeding with the project at the time it occurred, as opposed to delaying the project to a point when competitors' positions might have changed and the funding regime might have been different. However, in the absence of

[116] This had been raised in the second project group meeting by U4

any further data or modelling of such a scenario, it was decided when performing the calculations not to include this sort of complexity into the calculations.

5.7.2 Campus A comparison figures (to generate Campus C incremental figures)

For a continuation of Campus A without eco-refurb, Campus C income and expenditure projections were used, but altered as follows. Firstly, it was assumed that if Campus C were not built and Campus A continued, the income growth rate would be halved as more students would choose local competitors with newer campus buildings. Secondly, interest costs were reduced to match a lower level of borrowings (reducing over the forecast 20 year period) of £8m. The growth rate of all other cost items was kept the same. These assumptions were made by the author in the absence of specific data. As with the Campus C calculations, the figures altered between Drafts 1 and 2 due to more accurate discounting.

For a continuation of Campus A with eco-refurb, Campus C income and expenditure projections were again used. However, it was assumed in this case that the income growth rate would be 5% (marginally lower than the Campus C rate of 5.9%, to reflect the attractiveness of a refurbished campus). Further, it was assumed that borrowings would need to increase to £23m at the start of the forecast period, and interest costs were increased to reflect this. Again, in the absence of specific data these assumptions were made by the author.

5.7.3 Conclusions

With access to annual reports and some budgetary and forecast data, it was possible to make a reasonable attempt at the calculations. However, the author was required to make many assumptions, and it would have been useful to have had input from the University Finance department to corroborate these. With input from Finance it may also have been possible to disaggregate headings and give visibility to some of the missing categories in Table 5.7.

5.8 FCA detailed calculations – ‘wide’ economic impacts

Table 5.8 – Wide economic impacts, Campus C vs Campus A.

	Campus C:		Campus A:		
			No eco-refurb:		Eco-refurb#:
	Final 2nd draft	**First Draft**	**Final 2nd draft**	**First draft**	
	£	£	£	£	£
Multiplier effects (campus income)	337,529,948	297,100,943	242,730,973	229,786,607	276,591,243
Multiplier effects (International student ex’re)	10,567,059	#	7,313,746	#	9,411,228
Total	**348,097,007**	**297,100,943**	**250,044,719**	**229,786,607**	**286,002,471**

= Only calculated at Draft 2.

5.8.1 Stand-alone Campus C figures

The multiplier effect on the wider economy of the income generated by the new campus was modelled, and significantly amended at Draft 2.

Draft 1 calculations applied a multiplier factor of 1.18 to Section 5.7 income projections. This factor was based on the Strathclyde model as quoted in a paper by Higher Education Wales given to the Welsh Assembly Enterprise and Learning Committee (Higher Education Wales, 2007), and the National Assembly for Wales Enterprise and Learning Committee October 2009 Report 'The Economic Contribution of Higher Education in Wales' (National Assembly for Wales Enterprise and Learning Committee, 2009). Per Higher Education Wales, the "HEFCW grant received by Welsh HEIs in 2005/06 was £377m, generating an output from the Welsh economy of £1.99bn in the same period (HE 'turnover' plus direct multiplier effects) according to the University of Strathclyde model" (page 1). This translated into the following: "For every £1 million invested in HE by the National Assembly (via the Higher Education Funding Council for Wales) in 2005/06 the sector contributed £5.3 million to the Welsh economy"; and "The HE sector in Wales had a turnover of £918 million in 2005-06. The HE sector in Wales helped to generate a £2 billion output to the Welsh economy once direct multiplier effects are included." (page 2). Therefore, the additional multiplier effect was = 2,000m - 918m = 1,082m, giving a factor to apply to turnover of 1.18. Higher Education Wales noted that the Strathclyde model multiplier was conservative (as it did not take into account the effect of productivity improvements or knowledge and/or technology transfer). The income projections produced were discounted to present value utilising the same discount rate (5.22%) as applied to the direct income and expenditure in the previous section.

Draft 2 calculations altered the Draft 1 figures as follows: the accuracy of discounting calculations were improved; a larger multiplier of 1.38 was used; and an additional multiplier effect – the effect on the UK economy of International students and visitors to UK universities – was taken into account.

The multiplier used at Draft 1 seemed unusually low when compared to the multiplier calculated in UUK's fourth study on the effects of higher education on the UK economy (Kelly et al., 2009), which was also based on the Strathclyde model[117]. The UUK factor was therefore used in the Draft 2 calculations, in the absence of corroborative data for the Higher Education Wales figure above.

It had been estimated that the additional benefit to the UK economy generated by International students and visitors to UK universities was equal to £3.45bn per annum; further, total UK university fee income for 2007/08 was £23.4bn (with 13% of income being obtained from International students (Kelly et al., 2009). The income of University X for that period was £42.75m (with 3.79% arising from International students), which was 42.75m/23.4bn x 100 = 0.183% of the UK total. If International students and visitors generated £3.45bn for the UK economy, it was calculated that University X's share might therefore be 0.00183 x 3.45bn = £6.3m per annum. However, given that University X had a lower proportion of International fee income than the UK average, it seemed sensible to pro-rata this figure down, by 3.79/13 to give £1.84m. This figure was then pro-rata'ed down further to reflect Campus C student headcount, and the growth rate discussed in Section 5.7 was applied over a 20 year period to obtain projections of the impact for Campus C. Figures were also discounted to present value using the technique described above.

The multiplier effects of the expenditure on the new campus were separately highlighted in the construction phase of Versions 2 and 3 of the FCA for HE model. However, when Draft 1 calculations commenced, it was decided for simplicity that only the multiplier effects of total campus income (part of which was being paid, front-loaded, as a fee to the building contractors and other professionals involved in the construction of the campus) would be calculated. Therefore, multiplier effects were only included in the 'use' phase and were not

[117] A number of the project group members also questioned it

split between ‘construction’ and ‘use’, which would have been a more accurate reflection.

5.8.2 *Campus A comparison figures (to generate Campus C incremental figures)*

Exactly the same processes were applied to the projected Campus A income figures (which were discussed in Section 5.7 above), to give the ‘wide economic’ figures for Campus A. The same adjustments were also made between Drafts 1 and 2.

5.9 Overall conclusions – FCA calculations

These conclusions ultimately link to the first two thesis objectives, which seek to: (a) further evaluate the difficulties inherent in the FCA process; and (b) determine whether advances in scientific knowledge and sustainability awareness now make FCA calculations more feasible (as compared to previous FCA applications).

5.9.1 Summary of figures produced

For Campus C 'standing alone', positive economic impacts ('narrow' and 'wide') dominated the sustainability profile (£592.7m; being 89.8% of total impacts in Table 5.3a). This is consistent with prior SAM applications (for example, see Frame & Cavanagh, 2008). Other impacts in comparison were small: negative environmental impacts of £10.8m represented 1.7% of total values; negative resource impacts (£53.7m) were 8.1%; and positive social impacts (£2.5m) were only 0.4%. It was noted that environmental and social impacts were likely to have been significantly understated. The most significant negative environmental and resource impacts related to transport emissions of people travelling to and from the new campus; environmental impacts of demolition and reuse of the Campus A site were also significant. These items will be taken forward in policy recommendations in chapter 7. Incremental impacts calculated showed resource, social and economic 'gains' (when Campus A theoretical impacts were deducted from Campus C impacts, under both theoretical scenarios), but environmental 'losses'. Environmental gains from usage of the new campus (and due to its location) were cancelled out by the negative environmental impacts of building the campus, demolishing Campus A and redeveloping the sold Campus A site for housing, and the losses were greater under the Campus A eco-refurb scenario due to an assumption that Campus A pollution impacts from gas and electricity usage could be cut by 80% if an eco-refurb took place.

5.9.2 Illuminatory nature of model and calculations

Chapter 4 Section 4.2.6.1 constructed SSM root definitions to describe the sustainability discourse present at University X prior to the FCA for HE model-building and calculations. Two definitions were built, one relating to sustainability measurement in general and the other specifically relating to Campus C. It was noted that University X was measuring the 'sustainability' of Campus C ('P') by undertaking an environmental BREEAM assessment ('Q'), in order to obtain grant funding and marketing collateral ('R'). Some interviewees thought that the BREEAM Excellent rating would make the new campus 'more', 'relatively' or 'wholly' sustainable, and achievement of the rating was generally seen as a 'good thing'. Further, three interviewees felt that new builds would make institutions more sustainable, although this was seen as necessary but not sufficient for sustainability.

The root definition for the final FCA for HE model constructed in Section 5.1.6 noted that University X was now measuring the sustainability of Campus C ('P'), using a variant of FCA ('Q'), in order to contribute to organisational change ('R'). Crucially, FCA for HE was different to BREEAM in that it sought to measure impacts under a *holistic* set of sustainability categories (environmental, resource, social, economic narrow & economic wide). The FCA calculation process illustrated the limitations of the BREEAM assessment as an environmental measurement tool, namely: a failure to consider structural materials; narrow boundaries (in that the impact of transporting building materials was only measured from their site of manufacture); a failure to model water usage or waste production; and over-simplistic transport assumptions that dis not model realistic transport habits and hence understated pollution.

Further, FCA highlighted the environmental and resource costs of building and operating a new campus (stand-alone Campus C, £10.8m and £53.7m respectively, as noted above), significant costs that would currently not be accounted for in financial statements produced to generally accepted accounting principles. The incremental analysis assuming the theoretical continuation of Campus A reversed the negative resource impacts, but still produced negative environmental impacts (£1.3m with no eco-refurb; £1.9m with eco-refurb). The results therefore showed that the decision to build a new, much more environmentally efficient building did not lead to the immediate environmental benefits one would expect once wider impacts were taken into account (such as the use that the original demolished site was put to)[118]. This raised questions as to where impact boundaries should be set and where an organisation's responsibilities end. (It was however noted that running the calculations for a longer time period would eventually lead to net positive gains.)

5.9.3 Feasibility and success of calculations

When examined holistically, it can be stated that the calculations proved both feasible, and reasonably successful (subject to caveats discussed in Section 5.9.4). The Section above has illustrated the *value* of the calculations produced in that they illuminated a number of issues that were not previously visible. This Section will look at feasibility and success from a calculation and data availability point of view.

FCA for HE attempted to 'piggy-back' on existing activity and impact data collected such as the BREEAM assessment. This partially worked as, for example, embodied carbon data for the life cycle of building material component units, the building energy emissions rate, and the average transport emissions rate were available from BREEAM and construction waste, water and energy usage data was available from the building contractor. These sources could be utilised in future FCA calculations (while recognising the limitations of BREEAM). New data was also collected using transport surveys. Conversion factors were available from multiple sources, and proxy studies were utilised were necessary in the environmental and social categories. A final product was therefore produced that

[118] Note the evidence in chapter 6 which suggests that the model and calculations altered the perceptions of people involved in the interviews and project group

generated monetary figures for the majority of the impacts discussed in the project group meetings. For example, 21 of the 32 impacts listed in Table 5.3a were monetised, and these impacts often contained many sub-categories. (However, the success rate differed between overall categories as will be discussed below.) Impacts monetised compare favourably with previous FCA experiments. For example, the experiment detailed in Herbohn (2005) did not lead to any calculations being completed, and the experiments recorded in Antheaume (2004) and Bebbington & Gray (2001) resulted in very few impacts being monetised. In previous applications of the SAM it was recognised that it was not possible to monetise all impacts, and the analysis was limited to the most important impacts (in Baxter et al. (2003), when the SAM was applied to a typical oil and gas field operated by British Petroleum only 22 of the most important impacts were monetised). It was also noted in the Sections above that the calculations evolved between Drafts 1 and 2 and that this illustrated the value of running two learning for action cycles, each involving a project group meeting with subsequent calculations.

5.9.4 Limitations of and difficulties experienced with calculations

To caveat the ‘feasible and reasonably successful’ claim made above, it should be noted that a large number of difficulties, limitations and omissions were still noted in Sections 5.4 – 5.8. The most significant are summarised below per area. This application could hence not be described as a ‘utopian’ application as imagined in chapter 2 – it instead reflects the pragmatic, incomplete, realistic outcome imagined. Chapter 2 noted that extant FCA applications: were resource intensive; found it difficult to obtain costings; sometimes required proxy measures; faced questions over the rigour of estimates; and tended to exclude social measures (with the exception of the SAM). Very similar motifs were noted with the FCA for HE calculations. The calculations were daunting and took up much more time than the author had planned (they were ‘sub-contracted’ to the author by the project group, and the calculation phase took a year longer than originally anticipated). Obtaining activity data and impact and monetisation conversion factors in some areas was less straightforward than first imagined. It was necessary to draw data from a diverse range of sources; a large number of literature searches were required which took up much time resource and which were not always successful in the time available (more time and manpower resource would have helped). Rudimentary proxy figures from existing studies had to be used for some of the impacts monetised. In certain cases, impacts were not able to be calculated and/or monetised. Many figures used were subject to great uncertainty, and multiple costing figures added to this uncertainty. The exercise was not able to call on a settled and complete data set that was reasonably beyond dispute and which had been applied to similar projects before. While figures obtained could be said to illustrate how the model could be used for decision-making purposes, certain areas would benefit from further detailed research to determine more fully impacts and monetisation factors. The lack of a settled data set and the significant time taken to find data could be seen as a barrier to future applications, and could hinder dialogic applications as the calculators get bogged down in searches for data that prevent sufficient and timely conversations occurring.

Environmental

In total, 8 out of 13 activity categories were measured, converted to impacts and monetised for Campus C 'standing alone' (Table 5.4). Difficulties can be summarised as follows. In addition to the BREEAM issues already noted in 5.9.2 above, problems were encountered matching BREEAM material component units between Green Guide editions to obtain CO_2 emissions. Impacts may have been understated for a number of other reasons too. Firstly, only CO_2 data was available for the BREEAM material units, despite climate change only representing 22% of their total impact. Secondly, large variations were noted in damage costs available. For example, the damage caused by carbon emissions was costed using an average social cost of carbon; the highest SCC available would have generated total environmental costs of £235m. Thirdly, conversion factors were often not available for lower volume pollutants (such as sulphur dioxide). Fourthly, certain Campus C 'in use' pollution impacts were not calculated due to data or time constraints – for example, the impacts associated with campus water usage and waste, and the impact of purchasing new IT equipment and library books. Finally, no attempt was made to determine whether selling Campus A (which had extensive grounds with wooded and grassed areas) to housing developers would lead to a loss of biodiversity (and the subsequent cost of this loss), or to calculate the resource impact of housebuilding.

Reliance was also placed on rudimentary proxy studies for a number of impacts (such as the impact of demolishing Campus A), and a mismatch occurred between the BREEAM assessment timescale (60 years) and the FCA for HE projection period (20 years).

In conclusion, significantly more research is required to build environmental data sets.

Resource

Three out of six activity categories were monetised per Table 5.5. The opportunity cost of consuming non-renewable resources was based on current prices paid for materials or fuel, and it was recognised that this was problematic – current prices might not reflect resource scarcity. No attempt was made to inflate/deflate or discount future prices. Further, it was not possible to measure the creation of intellectual capital or infrastructure resources. As with the environmental category, further work is required to build more nuanced resource data.

Social

This category had the lowest success rate, with only one activity area out of seven monetised per Table 5.6 (knowledge transfer outputs). Further, these were likely to be significantly understated given that the measure was based on an incomplete proxy study. A number of potentially significant impacts were not able to be measured in their own right (such as accessibility and social inclusion). It can be concluded that this area requires the greatest volume of development work to generate usable data for future studies.

5.9.4 Dangers of presenting economic and (potentially understated) environmental and resource measures together

The calculations produced using an average social cost of carbon highlighted a perennial problem with sustainability analyses conducted in monetary form; the income from projects often tends to dwarf the environmental and resource costs associated with them, which might lead to the conclusion that the environment can be ignored in pursuit of economically beneficial income. Indeed, one interviewee in the post-intervention interviews appeared to take this view. However, other interviewees noted that it was necessary to present all impacts together in order to view a holistic picture.

5.9.5 Final conclusions

To conclude and link the discussion to the thesis objectives identified above, the FCA for HE application has evaluated the difficulties, limitations and omissions inherent in the FCA process and the data available, and noted that the issues replicate those found in existing applications. However, a level of data *was* available during this study that allowed a reasonable attempt at monetisation across headline categories, so it is concluded that the current state of scientific knowledge and sustainability awareness now makes FCA calculations feasible, which may not have been the case in certain contexts in the past.

The project undertaken has ultimately added another FCA application to a relatively small body of literature and might provide the beginnings of a standardised framework to assist future FCA applications, particularly in the HE, construction and urban planning fields (although it will arguably be of use to any institution seeking to apply FCA). The HE sector in particular has been strongly encouraged to improve its sustainability performance and demonstrate its sustainability credentials (see chapter 4) and the model and calculations were welcomed by some interviewees in chapter 6 as being applicable in a number of HE, construction and planning contexts.

CHAPTER 6: EVALUATION OF FINDINGS OF POST FCA-CYCLE INTERVIEWS & OBSERVATIONS AGAINST THEORETICAL LENSES AND THESIS OBJECTIVES

6.1 Introduction

This chapter evaluates the impact of the FCA for HE intervention at University X. To do this it draws on a second round of interviews that were conducted following the second FCA cycle (hereafter referred to as 'post-intervention' interviews), plus author observations of organisational (non)behaviour. (It also refers back to the exploratory finding-out interviews analysed in chapter 4 and records of the project group meetings where required.) Table 6.1 below lists the project group members and the dates that they were interviewed. Note that the interviewees in italics (U7, U10 and U13) had left the institution by the time of the post-intervention interviews and so were not interviewed. The codes correspond to those in chapter 4, Table 4.1. In total, eight people were interviewed.

The interview and observational data is analysed according to the three theoretical lenses used previously in this thesis. Firstly, the dialogic nature of the FCA for HE process is evaluated by benchmarking against Fraser's Dialogic Heuristic Framework ('DHF'), Brown's critical dialogic principles and Bebbington et al.'s dialogic motifs (Section 6.2). Secondly, the level of organisational change (or non-change) precipitated by the intervention is evaluated using Laughlin's organisational change framework (Section 6.3). Thirdly, institutional theory is employed to provide explanations for management attitudes and inertia (Section 6.4).

Finally, Section 6.5 concludes by linking the analyses to the thesis objectives stated in Chapter 2, namely to: (a) further evaluate the difficulties inherent in the FCA process; (b) determine whether advances in scientific knowledge and sustainability awareness now make FCA calculations more feasible (as

Table 6.1 – project group/interviewee details

Code	Interviewee by type of role (all members of project group)	Attended:		Date of post-intervention interview
		1st PGM?	2nd PGM?	
U3	University Environmental Officer	Y	Y	14/04/2011
U4	Director	Y	Y	22/03/2011
U5	University Senior Management	N	N	15/03/2011
U6	Dean of School	N	N	20/04/2011
U7	*Director*	*Y*	*N*	*N/a*
U8	Dean of School	Y	N (A)	14/03/2011
U9	Director	Y	Y	12/05/2011
U10	*Director*	*Y*	*N*	*N/a*
U11	University Senior Management	Y (B)	N (C)	07/04/2011
U12	Head of Subject	Y	Y	14/04/2011
U13	*Head of Department #*	*N*	*Y*	*N/a*
		8	**5**	

Key
Note: 'PGM' = project group meeting
(A) Gave thoughts on first draft of FCA calculations in separate one-to-one meeting
(B) Had to leave first meeting early due to other commitments
(C) Gave thoughts on first draft of FCA calculations via e-mail
\# U13 joined the project group for its second meeting due to a research interest in sustainability (he was not involved in the first round of interviews). However, he had also left the institution by the time of the second round of interviews.

Table 6.2 – Amalgamation of DHF and critical dialogic principles, drawn and amended from multiple Fraser (2010) tables and Brown (2009). **See pages 53, 54 & 57 in chapter 2.**

Brown Critical Dialogic Principles	Fraser's DHF				
		Attribute	**Dialogic**	**Organisational conditions for dialogic account**	**Non-Dialogic/ Monologic**
Ensure effective participatory processes	Purpose & processes	**1. Purpose**	Medium of critical reflection (so that broader elements of sustainability can be raised and acted on); exploration of alternatives; raising of consciousness.	Organisation assists in creating spaces to enable transformation (possibly more than one) from within.	Convince, subdue, legitimate and manage (one group over another). EG – SAM vehicle for 'experts' to demonstrate to 'lay-people' that most efficient action taken in regard to project.
Ensure effective participatory processes	Purpose & processes	**2. Process**	The process of constructing an account fosters critical questioning, problematisation, reconceptualisation (potentially of the project itself) and action.		Standardisation/ benchmarking, client-service provider transaction.
Ensure effective participatory processes; Avoid monetary reductionism; Recognise multiple ideological orientations; Be open about subjective and contestable nature of calculations	Content, participants and communication	**3. Content**	Heuristic learning – images, metrics, general language. Unpredictable content – decided on by people constructing the account, as a result of dialogue (which does not need to be consensual). SAM to include co-produced content and presented in multiple ways. More than one SAM constructed if voice of group/individual lost with construction of only one SAM. SAM might even be replaced; the framework is only a starting position.	Content provides medium for authentic voices with real-world problems to be voiced regardless of how previous accounts have been constructed.	Economically manageable aspects of business, formal and standardised language often monetary in value. Predictable content and presentation. SAM would be presented as part of formal business report, extension of a managerial toolkit. Would stick to best-practice methodology. Heavier emphasis on output rather than process.
Ensure effective participatory processes; Avoid monetary reductionism; Recognise multiple ideological orientations; Be open about subjective and contestable nature of calculations; Resist new forms of	Content, participants and communication	**4. Knowledge Claims**	Multi-perspectival and temporal – so always open to questioning and subject to re-exploration. Knowledge co-produced but contestable. A SAM is the product of the social and historical contexts at the time of its construction. A SAM produced under a set of influences during a period, is able to be explored with differing influences, both current and in the future.	There is no monopoly on truth claims as all have relevant realities to the participants. The account is not the reflection of one person at the expense of others, and the leadership structure would be open to conflicting reports prepared by staff.	Ahistoric, general portrayal of timeless truths and unquestionable facts. 'Correct' and 'right' answers provided. SAM might be used to conduct benchmarking exercising.
Ensure effective participatory processes; Easily accessible for non-experts; Recognise multiple ideological orientations; Be open about subjective and contestable nature of calculations; Be attentive to power relations	Content, participants and communication	**5. Legitimate Voices**	'Experts' and 'non-experts'. Inclusive and polyvocal. SAM to include a broad range of people. Traditional notions of expertise heard, but not at the expense of others (who may be considered to have traditionally unrecognised 'expertise'). People also have the right to not contribute.	'Experts' in an organisation would be recognised for the special skills they bring and would be responsible for highlighting the contestable nature of problems.	Privileging of experts, single discipline. Inclusion of 'correct' people would provide a strong basis from which to make rigorous knowledge claims.
Be attentive to power relations	Content, participants and communication	**6. Communi-cation Sites**	Any intersection between or within the organisation is a valid communication site (for SAM and associated discussions). No restrictions on who can communicate with whom in the construction and questioning of a dialogic SAM.	The organisation has a flexible boundary and facilitates communication occurring in multiple parts of the organisation and with people outside the organisation.	Single boundary between the organisation and community. Defined by formal internal structures. SAM would be constructed and communicated via formal communication channels, to the people requiring results; it would not be presented if it revealed 'inconvenient truths'.

Table 6.2 (continued)

	Attribute	Dialogic account	Organisational conditions for dialogic account	Non-dialogic/ monologic account
Time-scale, size and ownership	**7. Time-scale**	Flexibility in time-scale to reflect natural action cycles as appropriate. Therefore might look 50 or 100 years into the future and go beyond end of project.	Account considers time-frame so that 'real world' problems of account constructors can be raised and critically discussed. Organisational audit procedures would not have to conform to yearly cycles, but would follow continuous audit cycles within the conversations.	Whatever time-frame legally required or considered best-practice as determined by experts. Standardised annual or quarterly reports. Long-term time-frames often seen as more uncertain and therefore marginalised.
	8. Scale	Scale is flexible. May consist of highly aggregated or detailed information. SAM maybe produced on several different scales and not necessarily only consider the immediate project.	The organisation does not have to be the centre of the account. Instead the issue of relevance can take centre stage and second or third level impacts may still be considered even if they do not occur within the legal definition of the organisational entity.	Organisational entity and other formal structures, often highly aggregated to avoid 'commercial sensitivities' being divulged. Exclude effects outside entity.
	9. Ownership	No one person or entity can own an account. Owned by construction participants and anyone who has an interest in issues raised or not raised. The SAM a starting point for debate and shared with anyone for construction/deconstruction.	The organisation would freely share the SAM framework and would not move to collect royalties.	Intellectual property owned and reinforced via legislation if necessary. SAM might be owned by organisation that patented it. Users would have to pay royalties and deviations from the original best practice SAM would be viewed as a breach of copyright.

compared to previous FCA applications); and (c) ascertain whether FCA engagements conducted in an explicitly dialogic manner lead to organisational change.

6.2 Dialogic nature of the FCA for HE process benchmarked against Fraser's DHF and Brown's critical dialogic principles

The analysis below will, for each DHF attribute (Fraser, 2010), highlight in turn dialogic and non-dialogic motifs. Brown's critical dialogic principles (2009) and Bebbington et al.'s (2007) dialogic motifs will also be addressed where appropriate. For ease of reference, the tables depicting Fraser's DHF and Brown's principles (first used in Chapter 2) are amalgamated and reproduced in Table 6.2 above.

6.2.1 Purpose & process

The explicit use of the SSM learning for action cycle attempted to build in critical questioning, problematisation, reconceptualisation and action to the process of developing and applying the FCA for HE model. The whole process was designed to allow exploration of alternatives, critical reflection and the raising of consciousness. The following narrative will analyse success in these areas.

Alternative impacts were openly explored and critiqued in finding-out interviews and project group meetings as the issue of measuring sustainability was problematised. Participants were briefed from their first contact with the project that the educational nature of the process was seen as more important than the outputs produced. Six out of seven interviewees in the post-implementation interviews thought that the model development process and calculations had been educational, and interviewees noted various educational benefits: the ability to communicate with people on other projects in a more informed way; the effect on higher level management; and the fact that the project made you think about things that you normally didn't think about. The process appears to have prompted reflexivity (Alvesson, 2003) in the participants. They were able to view the subject matter from different angles, and challenge their initial interpretations with the views opened up and aired by others. For example, one interviewee noted that he had *"learnt far more about an accounting point of view and what people mean about FCA as well as getting other people's views around the institution about how they understand it. (U4)."* This then led, in some cases, to reconceptualisation of the sustainability of the new campus. There were multiple examples of people's consciousness being raised and perceptions being altered (including perceptions of BREEAM), such as:

> *"I've learned things. I've come into contact with other projects (regeneration project) and new schools, and they all talk about BREEAM. Reading the reports it is quite clear that BREEAM is not the be all and end all of environmental impact work. It has opened my eyes to that."*

> *"This piece of work is part of a journey, adds to our knowledge, helps us think in different ways, helps people go beyond naive assumptions that a new building is always going to be environmentally better than an old building, and thinking of the whole process of demolition of the old building, use of the old building, seeing that as one big picture. That to me has been most powerful outcome of this. Very useful .... This study has broadened horizons and thinking."* (both U6)

> *"A bit of an eye-opener re options you could go through and the effects of the whole process. A useful tool to demonstrate the cost of impacts and it does hit home that if you build a whole new campus and abandon an old campus that is going to be the environmental cost. Helpful ..... It paints a clearer picture of what sustainability is I guess."* (U3)

> *"We were all assuming that because it was a BREEAM Excellent building and all the rest that it would have a net positive impact. So it's a salutary to be*

reminded that the extra process of building the building itself has a major impact, and it will take decades for any gain. An important reminder." (U5)

"I suppose I had a more optimistic view of BREEAM before I looked at what it did. I thought, oh it's BREEAM, that'll be fine, good. After I talked to (another member of the project group) and other people about it I realised it's a minimum thing. Count me as a real optimist first, and then... actually..." (U12)

I have been [made] much more aware of the long-term costs of certain construction choices. And also the tension between what sustainability means over different time periods – for example, short-term BREEAM or a longer term model. And if you could chart them, how do those things relate to each other....." (U4)

Further, one interviewee was struck by the ongoing environmental cost exceeding the immediate cost, and another was surprised that the negative environmental impact of Campus C under the average social cost of carbon was quite low ("*It does seem quite small doesn't it? It goes back to ... how do you put a price on the environment?" U3).* Two other interviewees thought that the new campus was more sustainable than they were expecting.

People also noted that the process would be educational for others trying to conduct a similar exercise in future:

"[It's educational] for you, for people involved in it, and for people coming along trying to do something similar certainly." (U12)

(Interviewer: Is the model of limited relevance outside of the project group?) "It depends how you want to write up the final conclusions. Are they around the outcomes of the project or around the model building process or both? My guess is that the financial outcomes/scores/values are probably relevant but of

> *limited wider significance,* ***but the model building will be of much wider applicability.*** *"* (U4)

The educational nature of the process was built upon a number of foundations. Firstly, seven out of eight participants stated that the model building process had been both participatory and democratic, for example:

> *"The indications I've had is that you've wanted to involve as many people as relevant and appropriate, and you have been very open about sharing drafts etc. So absolutely I'd agree with that."* (U6)

> *"It did seem to involve key stakeholders as far as was manageable. It is difficult for me to see anything that was obviously missing from the process. When I looked at what you were planning to do, it seemed to be capturing the key issues that I saw. I wouldn't have any arguments with it. It seemed a fairly comprehensive approach."* (U5)

> *"The meetings we had yeah, because I remember we all had an input. Part of it was trying to get a common understanding of what the issues were."* (U11)

> *"Yeah I think so. You took note of ideas put forward so yeah."* (U3)

Secondly, the majority of participants stated that they felt *part* of the process (for example, U4 commented: *"Yeah, I felt I could add as I wanted to, I could offer comment openly."*) but there were some caveats, which are dealt with below (Section 6.2.4). Thirdly, all participants felt that the process had been effective for developing a sustainability measurement model, although again some caveats were raised that are also dealt with below in Section 6.2.4. Fourthly, participants generally felt that the final model (and calculations) produced were clear and understandable (which will have improved their educational impact), although two interviewees raised doubts regarding understandability due to concerns over calculations and costings. Finally, some interviewees implied that involvement in the whole process had altered the impact that the results of the model had had on them. Three stated that involvement gave them a greater understanding of the results and/or the process when reading the final report; one thought that engagement throughout meant that there was less need to interrogate the detail when reading the final report; one thought that involvement gave greater impetus to read the final report; and one thought that he would have been influenced more if he'd engaged more closely:

> *"I can't say it helped me understand totally what the thing was about. If I'd engaged a bit more closely it probably would have done."* (U11)[119]

While action to measure (un)sustainability occurred following the initial finding-out interviews and first project group meeting through the production of calculations using the FCA for HE model (which was the action designed into the SSM LFA cycle), the ability for the results of the process to influence the construction of the new campus were very limited given that the design had already been approved and that construction had commenced. (See later comments regarding the timing of the project.)

University X could be said to have provided the organisational conditions for a dialogic account, as it allowed space for two rounds of interviews and the project group meetings to take place. This enabled the transformation of people's perceptions regarding sustainability performance.

However, non-dialogic motifs could also be noted. There was some evidence that senior management were hoping that the FCA calculations would show that Campus C was sustainable (or at least more sustainable than the existing University infrastructure) and so help to legitimate their decision to build it. In an informal discussion with one senior manager (who had not responded to an invite to be interviewed or join the project group) that occurred following the completion

[119] As can be seen from Table 6.1, U11 did not attend all of project group meeting 1 and could not attend project group meeting 2 (this was due to a busy diary and not lack of interest in the project).

of the FCA calculations, he noted that another senior manager had wanted to use the FCA exercise as a marketing tool, but that this was not appropriate once results had been produced[120]. This attitude corresponds to the ‘convince, subdue, legitimate and manage’ purpose of a non-dialogic account per Fraser’s DHF. Further, there was also evidence that senior management saw FCA for HE as a benchmarking tool (using FCA for benchmarking is also seen as undialogic by the DHF). U11 was uncomfortable with the fact that the model had only been applied to one case, and argued that a number of iterations (across different situations) would be required to produce meaningful output:

> *“But isn’t the thing about the methodology that you’ve got to do it several times to build up a picture? What you came up with were some measures and the answer is X .... but until you apply it several times in different situations you can’t get a definitive view as to whether X is a valid answer or not.”*

6.2.2 Content and knowledge claims

The FCA for HE content was presented in two ways, as illustrated in Chapter 5 – stacked bar charts, and tables listing all items identified (the majority of which were monetised). The content was co-produced (to the extent that impacts were agreed via the finding out interviews and the project group meetings; see later discussion re subcontracting of calculations to this author), and participants were given licence to change the model as they saw fit through dialogue. Final content was hence unpredictable, and sought to recognise multiple ideological orientations. Project group participants at the first project group meeting were encouraged to build their own individual ‘FCA for HE’ models after viewing the author’s initial model as an illustration. As noted in chapter 3, while this did not occur (as the meeting was taken up with the group engaging in an open discussion debating various issues surrounding the ‘FCA for HE’ model

[120] This could be seen as further evidence that FCA for HE changed perceptions. Prior to the intervention, the senior manager who made this comment presumably thought that Campus C would only produce positive news on sustainability.

presented), all issues discussed at the meeting still fed into revisions of the model and each group member was also asked at the end of the meeting to identify their five most important impacts. Therefore, multiple orientations were included[121]. Alternative sustainability measurement tools aimed at the HE sector were also introduced to the project group at the start of the first meeting to present alternatives to FCA, but the group did not choose to use any of these (there was no desire to replace the SAM-based FCA for HE). It could be argued that one of these should have been used as a counterbalance to and check against the FCA calculations, but this would have been very difficult given time constraints and the complexity of the FCA calculations.

In total, a large amount of dialogue occurred between the author and various participants prior to, during and after the model building and calculation stages. As first noted in chapter 3, a significant number of managers and other parties participated in the initial finding out interviews (twelve) and ten managers and/or sustainability champions subsequently volunteered to join the project group. The participants could be said to represent many different perspectives and 'work role' identities (Bebbington et al., 2007). Project group meetings were reasonably well attended (eight people attended the first meeting and five attended the second; two people who could not attend the second meeting gave feedback on the first draft of FCA calculations by e-mail and in a separate meeting, respectively). Eight people were also interviewed following the completion of the FCA calculations and issue of the final report. All project fora allowed open discussion of the issues. For example, the interviews were not conducted with limited interviewer interaction as one of the aims of the learning for action cycles and the thesis was to alter worldviews regarding sustainability (in other words,

[121] Proof of this could be seen in that only one interviewee commented that it might be difficult to construct a model that would include everyone's viewpoints: *"Probably partially......* [in answer to the question of whether the process had been effective] *......it depends who holds the pursestrings how you understand the model. So if you take the Head of Estates they would look at the cost of build and maintenance. A Vice Chancellor with a very long-term view might say the asset is the real estate, what is it worth to the University over 100 years. [Interviewer: So are you saying it's difficult to develop a model that's got everyone's viewpoints in it?] Yeah. Perhaps the model needs to acknowledge what it has excluded and why. The difference between economic value and wider value. People into ESDGC might have a different view from one that's just pure economic costing."* (U4)

interviewer bias was not seen as a problem). Interviews therefore contained rich discussions between interviewer and interviewees (for example about the content of calculations). It was also noted in chapter 5 Section 5.1 that the FCA for HE model significantly changed between versions 1-5 (and the calculations changed significantly between drafts 1 and 2) and these changes were partly due to the input of individuals in finding out interviews and the ideas put forward by the project group. Further, all interviewees thought that the correct impacts had been identified (for example: *"Yes. The group and you were very thorough."* U8; *"Looking at those you would think so. It seems like a fairly complete list to me*." U5; and *"Thought so. Best we could at the time.[122]"* U9), and relatively few suggestions were given by interviewees on additional measures that could have been identified. (Interviewees suggested including: the psychological effect of the new campus on the city; the impact on tourism; interactions with other projects going on in the area; the positive effect on local companies of winning additional business given their successful involvement in the construction of the campus; an adjustment to take into account actual transport habits of staff after moving to the new campus; the per head carbon impact of people passing through the campus; and the impact on trade in the city.) A majority of participants also agreed with the monetisation of impacts without significant reservations (for example: *"I think it's good to do that. Just talking in terms of tonnes of carbon doesn't really put it into perspective. Everyone sees money as a measure really don't they, Finance Directors, Vice Chancellors, they all see money so it's good to put it in terms of cost. It's a useful thing to do to demonstrate the monetary cost of it isn't it? A lot of time people see the £'s.... It's good."* U3). This could be seen as proof that they had participated fully at an earlier stage and influenced the outcomes satisfactorily; the process was effective in taking on board people's suggestions and capturing a holistic picture.

[122] However, the same interviewee later questioned whether the inclusion of the environmental damage cost of building houses on the old Campus A site was correct; the houses would have been built anyway (and possibly on a greenfield site further out that may have caused more environmental damage) as they had been included in the city's development plan.

The results arising from the two drafts of the FCA for HE calculations were presented to the project group in formal, professional reports. According to Fraser's DHF this could be seen as a non-dialogic characteristic. However, as the results were being presented to a group of (mainly) senior managers, it was felt by the author that professionally presented reports were appropriate and necessary to award the results legitimacy. However, the reports in no way implied that the calculations represented a 'true and fair' view. The reports transparently stated the rationale and methods behind the figures calculated (or not calculated) and also clearly stated that this was *an* account of sustainability and not *the definitive account* given the subjective and contestable nature of calculations.

The subjective and contestable nature of calculations was something that was stressed by the author at each interaction stage with participants, including during the finding out interviews and at the project group meetings, in addition to inclusion in the written reports. U4 proved that the message had got across in the first project group meeting, as he commented that the FCA process should be seen as model building that created a discourse about sustainability rather than reaching an end-point. Some participants also explicitly recognised and accepted that the calculations were of this nature in the final post-intervention interviews, for example:

> "*It's not pretending to know the answer"*
> *"What you are doing with this is trying to get a rough serviceable model ... You have to have a willingness to live with that." (both U5)*

> *"The difficulty with these things, whatever model you develop there are always caveats. There is always uncertainty......You talk about this raising questions about some of the other thinking and I think that's absolutely right. I was never under the impression that it would end up with a perfect model." (U6)*

However, two interviewees did not appear to accept 'imperfect' figures. They were concerned about the methodology adopted / results obtained and were unhappy with the subjective nature of figures. For example:

> *"One of the things is trying to get a methodology for things you simply can't define or measure. One of the difficulties is measuring impact when the causal relationship between input and outputs is not direct..... It seemed to me that in the work that you were doing ... was getting that direct relationship between things where there was a fuzzy relationship......" (U11)*

U11 expressed concern about monetising subjective areas, and noted that despite knowing that there had been difficulties in getting figures and 'flakiness' surrounding some figures, figures had been worked out to the nearest pound. He stated that in reality, some figures were 'gut feel' and within a band. He expressed concern over how robust inputs were to generate outputs, and that things were open to interpretation. He also stated that things were being looked at in a deterministic way; probability and bandings could have been used as an alternative to illustrate subjectivity, although this would have involved more judgement[123]. U9 thought that the results *"looked expensive"*. He was concerned that factors could get out of date as technology and understanding changed, which would be problematic if such a model was used for decision-making purposes as an original decision might be invalidated at a later date. He also noted the danger of trying to estimate impacts and reach decisions in advance, without knowing the full impact or usage of a building.

This desire for 'correct', 'right' and 'accurate' answers corresponds with a non-dialogic account per Fraser's DHF.

[123] U11 noted concerns in the first project group meeting, too, stating that there were difficulties regarding where to set boundaries, forecast time periods and what data to use (and different choices would lead to large variations in results).

It is important to ask whether FCA for HE was a new form of monologism, whether participants were led to a new ‘right answer’ and whether any bias of the researcher came through. As noted in Chapter 3, this author instigated the FCA for HE project as it was felt that University X was not holistically measuring its sustainability impacts. This author also expected that as a holistic analysis had not been undertaken prior to the design and construction of Campus C, and due to the limitations of BREEAM, that Campus C was likely to exhibit many unsustainable characteristics which would lead to significant negative cost figures (for example negative environmental costs) in the FCA calculation. This would expose a weak sustainability paradigm. However, the author’s expectation of what the calculations might show was not communicated to the interviewees or project group. Further, when calculations were undertaken and negative figures that resulted were not as large as expected, although calculations were checked and more impact and monetisation factors sought for triangulation purposes, the author did not in any way seek to skew calculations or influence the thoughts of participants. Participants were not therefore led to a new ‘right answer’ and the impacts identified were chosen and/or approved by the participants. The author sought to remain objective throughout the process.[124]

It could be argued that the FCA for HE model avoided monetary reductionism. The project group meetings allowed people to state their opinions on which impacts should be monetised, with the result that only impacts that people felt comfortable with were monetised. A good example of this was the impact of crime on Campus C users. Figures were calculated by the author at the Draft 1 stage, but these were removed after the measure was debated at the second project group meeting (where it was concluded that it was too difficult to incrementally measure the effects of crime). Where impacts could not be monetised (either due to unavailability of data or because of a decision not to monetise), these items were still described in the report to the project group and

[124] There was only one instance when environmental costs were given ‘prominence’. In the presentation of the Draft 2 calculations, the economic impacts were moved to the right of the presentation table and environmental, resource and social impacts were moved to the left. However, this realistically did not alter the impact that they would have on the reader.

the headings relating to these impacts were displayed in the tabular monetised summaries[125].

6.2.3 Legitimate voices

A broad range of people were included in the project group to allow heterogeneity of discourse, and the author sought to facilitate dialogue during the project group meetings. However, it could be argued that a wider range of stakeholders should have been included, and this is dealt with below.

There were some doubts as to whether the model development and calculation processes, and the final results, were accessible to non-experts. Two interviewees noted that they felt reticent about contributing to the process given their background and skills (for example: *"Because of the nature of the project, a specialised area, I think it's difficult to know how to interact with it. I can interact in a general sense, ask questions etc, but when you get down to detailed accounting methodology that's your area ... people like me wouldn't feel that comfortable challenging some concepts and processes."* U6). As already noted above, however, most interviewees thought that the model was clear and understandable, and this demonstrated that the process had built a model that was able to be interpreted by lay-persons. Only two interviewees raised questions over understandability due to the way that the costings had been put together. In sum, it can be concluded that the positive responses re accessibility outweighed the negatives.

This author was probably viewed as an 'expert facilitator' by the project group (he was the only accountant on the group and he drove the project forward as noted by one interviewee; he was also seen as being in possession of a great deal of knowledge about the project). This might have been problematic, discouraging engagement and participation as noted below and possibly conferring a false

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[125] As noted in chapter 5 Section 5.1 there were only a few minor exceptions to this where items not monetised were removed

sense of authority upon the figures. However, transparency and detail provided in the calculation reports made clear as far as possible the basis of calculations and the assumptions made. Bebbington et al. (2006) noted that the reliance on experts could be diluted by the involvement of all stakeholders, and it might be argued that a wider circle of stakeholders should have been involved - see recommendations in chapter 7.

6.2.4 Summary – an effective, participatory process?

Analysis of the first five DHF attributes above has highlighted a number of strong dialogic motifs that should have led to an effective, participatory process with opportunities for human agency, and responses to the post-implementation interview questions generally corroborate this. However, participation and communication were inhibited by certain issues which will be analysed below.
Firstly, one interviewee was not sure that the model development process was democratic (even though it was participatory), as it was thought that the author had had to take some ownership to drive the process forward.

Secondly, all calculations were undertaken by the author, who amassed a large volume of technical data. This was agreed at the first project group meeting; the calculations would be subcontracted to the author but these would be reviewed by the project group and suggestions for changes sought from the group (this occurred after the first draft had been completed). However, this arrangement meant that project group participants did not have equivalent ownership of the calculations alongside the author. According to one interviewee, the author was "*living and breathing it* [the model and calculations] *and almost taking the role of what that group would do" (U11)*. It was also felt by the same interviewee that the model and/or calculations changed over time as the author worked on them, so when project group participants dipped back in they were not necessarily comparing like with like.[126] Another interviewee noted that *"We were all were giving bits, you were pulling it together and in possession of a great deal of knowledge. People were giving more than they were getting." (U8)*

Thirdly, gaps between the project group meetings and the presentation of calculation drafts were large - only two project group meetings were held (in January 2009 and November 2009), and FCA calculation reports were sent to project group members in November 2009 (discussed at second project group meeting) and February 2011 (the final draft of calculations). There was also little contact with project group members between meetings and a lack of information flows. Crucially, the gap between November 2009 and Feb 2011 meant that momentum and interest may have been lost, and interviewees in the Spring of 2011 were sometimes struggling to remember the model (this was admitted by U11 and noted by the author when conducting other interviews). The gap was caused by the extensive time taken to find impact values and monetise these while conducting the thesis research on a part-time basis, as noted in chapter 5 Section 5.9.4. The distance between project group members and the author, both in terms of day-to-day roles and seniority, may also have impeded communication, as the author did not feel wholly comfortable approaching senior staff that he did not see in his job role on a regular basis with informal updates (he also had little time to do this).

Finally, it was acknowledged by four interviewees that calculations would have had more impact if they had been conducted from the beginning of the life of a 'live' building project. (With Campus C the decision had already been taken to build and the design had been finalised. This downgraded the importance of the calculations and meant that the project group did not need regular access to them to assist with decision-making.) If this were the case, FCA considerations would ideally need to commence at the concept stage and the FCA process would need embedding into building project meetings and information flows

[126] This comment was however made by a participant who was not able to attend the second project group meeting at which the first draft of calculations were discussed.

(which would give it a greater chance of altering/being altered by the project). For example, interviewees noted the following:

> "*The development of Campus C was run with monthly meetings. With this methodology it would need to be embedded into those processes somehow*" *(U11)*

> *"If it was a live project you'd have at an early stage been involved with architects and surveyors, and would have talked about what could have got cheaper, what would have lasted longer, what was recyclable, and how those things relate to one another. So for this building, it might it have made sense for the longer term to invest in solar panels on the flat roof."* *(U4)*

As will be noted in chapter 7 and below, it is likely that these participation issues inhibited the effect that FCA had on University X in terms of precipitating change.

6.2.5 Communication sites

When undertaking the FCA for HE project, communication occurred in multiple areas of University X. The author spoke to a wide range of people internally (see discussions above), and was also allowed to speak to people outside of the organisation (such as architects, sustainability consultants, building contractor employees and the local urban development company). Further, as also noted above, it appears that people within University X spoke to each other about the project as it was ongoing. However, a non-dialogic motif was noted half way through the process. The first draft of the FCA for HE calculations (published in a report for the project group members) included some negative and controversial results, such as the cost of crime figures as noted earlier and the negative environmental impact of building and operating a new campus building. At this point a senior manager intervened to remind the project group that the results of the model should remain confidential to the group[127]. In particular, he was concerned about cost of crime figures and these prompted him to contact the local police force for clarification. He also commented that the results were ‘a bit of a curate’s egg’ given that there were both positive and negative impacts arising. The first draft of calculations were published in November 2009, a time of sensitive change management during the construction of the campus when students and staff were expressing reservations about moving from the existing campus, and the University would have been concerned about ensuring that the BREEAM Excellent rating was obtained to generate grant funding to cover part of the construction costs. A wider collection of stakeholders being involved might have persuaded the institution to ‘open up’ the process and acted as a check against what could be viewed as a closing down of the debate and an example of managerial capture.

One could argue that the whole FCA for HE process challenged ‘power elites’ in the organisation. As noted in various discussions above, it recognised multiple ideological orientations and generally allowed heterogeneity of discourse, although the confidentiality call above is one example of those in power privileging some discourses and silencing others. FCA for HE also altered perceptions that new builds (and their BREEAM rating) were a ‘good thing’. The impact of this ‘challenge’ is analysed in Sections 6.3 and 6.4 below.

6.2.6 Timescale, size and ownership

The timescale chosen for the FCA for HE project was chosen by the project group. In order to consider the long-term, a period of 20 years was chosen (this was a pragmatic compromise, as the ‘ideal’ timescale identified was the full life-cycle of Campus C). The project boundary was wide, considering all impacts

[127] Confidentiality had been agreed in a written agreement when access was first given to the researcher to University X for the project, and all interviewees/project group participants had been made aware of this (as noted in chapter 3). This promise of confidentiality was necessary to gain trust and access. It was however hoped that results could be disseminated more widely at some point. The reinforcement of confidentiality appeared to stop any future possibility of opening up the group and disseminating results to a wider audience.

inside and outside the boundary of the organisation. Both timescale and scale therefore fit with a dialogic account.

Fraser's DHF however states that no-one can own a dialogic account. It is owned by the construction participants and anyone who has an interest in issues raised or not raised. The SAM is a starting point for debate and can be shared with anyone for construction/deconstruction. The FCA for HE project was not copyrighted and so technically not owned by anyone. However, as discussed above it was decided that the results produced should not be openly disseminated part-way through the project.

6.2.7 Conclusions – extent to which the whole FCA for HE process was dialogic

The process did not correspond to the 'worst-case' scenario modelled in chapter 2, Section 2.13.2 (a wholly non-dialogic account based on the right-hand column of Table 6.2), but neither did it match up to the 'utopian' vision of a wholly dialogic account based on the left-hand column of Table 6.2. Instead, it could be said to align with the pragmatic, realistic outcome imagined in Section 2.13.3 as the majority of characteristics identified were dialogic but there were some non-dialogic motifs such as: the wish to use the FCA results as a marketing tool to legitimate the building of the campus and/or for benchmarking; concern over the accuracy of figures; the fact that a wider range of stakeholders could have been included; concerns over timing, communication and participation; and the desire of management that while poly-vocal debate could go on behind closed doors, they did not wish the whole exercise to be played out in the public domain during a sensitive period of change for staff and students. Further, the results of the process were not able to influence the outcomes of the Campus C project due to the timing of the project start. As noted above, it is likely that some or all of these factors reduced the impact that the FCA for HE process had on University X and lowered the chances of it leading to significant change in the organisation.

Also, as noted in chapter 2, given the resources and time available a pragmatic decision had to be made to produce just one model and set of calculations (incorporating all views as much as possible), rather than multiple versions. The approach was thus based on deliberative democracy rather than agonistic democracy per se, although the SSM learning for action cycle allowed participant input based on individual worldviews before an accommodation was reached on a common model. Finally, there did not appear to be any evidence of discursive decoupling occurring throughout the FCA process, which might have posed a threat to the dialogic nature of the process. Section 2.4.6 noted that dominant groups exist who seek to embed their dominant views and meanings into institutional structures and maintain these. Although discourse may be observed from both dominant and heretic camps, those espousing heretic discourses will ultimately begin to adopt the language of the dominant and the heretic discourse will disappear. However, the final FCA for HE model and calculations did not come to represent a dominant, managerialist, business-as-usual position given that they highlighted significant environmental and resource costs. The request for confidentiality provided evidence that the calculations remained uncomfortable for managers.

6.3 Organisational change

If it can be concluded from the section above that the engagement was conducted in a reasonably dialogic way (despite the existence of some non-dialogic motifs), then it is still possible to evaluate whether FCA engagements conducted in an explicitly dialogic manner lead to organisational change (thesis objective (c)). This section will therefore examine the organisational change that occurred (or did not occur) at University X.

The FCA for HE project did not appear to achieve the 'utopian' vision set out in chapter 2 of permanent second-order, morphogenetic change at University X, at least when this author surveyed the available evidence in 2011 and 2012. There was no evidence at this time of a colonisation (caused by the disturbance of undertaking FCA) or an evolution arising from management's decision to adopt FCA in the first place. The underlying ethos of the organisation per se did not appear to have changed (although, see the 'May 2013 reanalysis' discussion at the end of this Section for details of an initiative that might provide evidence of change over a longer period of time.) However, neither did a 'worst-case' scenario arise. The account was not curtailed as soon as it started to produce uncomfortable figures, such as the cost of crime figure in the Draft 1 calculations (a rebuttal), and neither did it become sidelined and marginalised before it was completed, as was the case with some of the applications observed by Fraser (2010) (a reorientation). Instead, this dialogic application followed a middle path that led to a change in perceptions and a significant change in practice and mindset (even if temporary, in allowing the project to operate fully and reach a conclusion). It might therefore have had some effect on values and beliefs (which might have influenced the most recent developments), and been more than the 'small' or 'symbolic' change noted by Archel et al. (2011) that simply embeds dominant interests.

Engaging in the FCA for HE process did change perceptions of most participants (some of whom were managers), given the examples highlighted in Section 6.2.1. Six interviewees were also specifically asked whether their perceptions had been materially altered, and four appeared to state that their perceptions had (especially when their answers were corroborated against answers given to previous questions, in particular to the question of whether the process had been educational). Four interviewees also stated that their involvement had altered their views on or given them more insight into the measurement of sustainability. Six out of seven interviewees implied that the process had been educational, including U9 ("*Yes I think so because as you've said it makes you think of things you don't normally think about or processes that you don't normally think about so yes.").* U9 had expressed sceptical views on measurement of sustainability[128]

[128] "I don't think we as a society have understood the word 'sustainability' .... How can we measure it when we don't know where we are?" (U9)

and concerns about the results obtained from the FCA for HE model, and so would perhaps be the least likely participant to have his perceptions altered. However, if he found the process educational then it is possible that his perceptions were indeed altered.

There was also some evidence to suggest that the intervention and the model and data created might affect both the institution and external parties going forward. Four interviewees stated that the FCA intervention might alter University decisions made/actions taken in future, for example:

> *"Yeah. Management have had a commitment to sustainability imposed on them and they are going to be looking for models to work with. So I think it will be used yeah."* (U12)

> *"Yeah. If we were looking in the future at knocking a building down (as we probably will be), we would look at the financial cost but also the environmental impact, the real cost of doing it. The footprint we were leaving behind."* (U4)[129]

A further interviewee doubted that future decisions would be affected given that the results showed that positives greatly outweighed the negatives, but he did think that if FCA was used on a 'live' project it would challenge preconceptions. Further, four interviewees thought that the current report and/or the model or data amassed might be useful to and have relevance for external parties in the future (such as the City Council and planning authorities, a regional ESDGC centre, or those involved in decision-making around new buildings), or might be able to be converted into a toolkit for HE in general.

The very acceptance of the model and calculations by the participants could be seen as a significant change in the mindset *and practices* of University X, given

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[129] U10, in the first project group meeting, also noted that it would be useful to link the FCA for HE project to future projects and use it from the start of these projects.

the low base from which it started (in terms of the lack of sustainability discourse in place, as noted in chapter 4's root definitions). As such it could be seen as a (temporary) change to the design archetype with some impact on beliefs. Chapter 5 illustrated the change in practices by comparing the original chapter 4 sustainability discourse root definitions with FCA for HE root definitions (Section 5.9.2). As noted in the analysis in Section 6.2.2 above, there was a strong willingness to participate in the project amongst University managers – a large number contributed in interviews and/or the project group. Further, as noted in Chapter 4 Section 4.5, prior to the first project group meeting accountancy was accepted as a driver of sustainability and FCA was reasonably well received (although some reservations were noted by some participants). The post-implementation interviews also noted a generally positive reaction of participants to the process, model and results. (Note the points made above about: the process being participatory, democratic and educational, and the altering of participant perceptions; the majority of interviewees who thought that the model and calculations were clear and understandable; all participants agreeing that the correct impacts had been identified; a majority agreeing with the monetisation of impacts without significant reservations; and the interviewees who felt that the work undertaken might impact internally and externally in the future.) Positive, general feedback such as the following was received:

> *"You've spent a good amount of time on this and it's well thought through. It has tried to include lots of things.....*
> *.....It has the potential to become a useful tool as well as an interesting academic study.....*
> *.....You have reasonable balance in your report with recommendations effectively, but with caveats and cautions. You will never get things perfect. As long as it takes things forward and helps with decision-making."* (U6)

> *"I was quite impressed ... this is quite unusual, I haven't seen a model like this before. If this is the first time such a model has been developed thought it was a fairly impressive one actually."* (U5)

All of these facts suggest legitimisation of FCA within University X, although two managers did express reservations over the FCA methodology and results and so it is likely that they granted a lower level of legitimacy to the process.

Why was FCA awarded some legitimacy? Based on the evidence gathered, one could speculate that it was accepted by some participants (or accepted for a period of time) due to: the lack of available information to holistically assess the sustainability performance of the University (both the lack of sustainability measurement tools and the knowledge to build or implement them); a desire to improve sustainability performance, due to a number of factors such as a sense of moral duty, pressure from government/funding bodies/customers/competitors/league tables (all noted in chapter 4); the attractiveness of marketing the University as a 'green' institution (note discussions earlier); the rigour with which the exercise was conducted (see positive comments above re the process and calculations and the conclusions to chapter 5 for an analysis of the success of the calculation process); a desire for a model that tried to cover all key areas of sustainability, however 'rough' or uncertain the measurements; and a willingness to engage in an educational process.

Finally, it should be noted that Fraser's (2010) study of FCA applications equated good/real change (which Fraser saw as significant change) with instances where full cost accounts were conducted in a dialogic manner. Therefore, given the conclusions above (that the FCA for HE process was predominantly dialogic), one could conclude that some significant change might have occurred at University X. Indeed, one could speculate - if the application had *not* been conducted in an explicitly dialogic manner, it is likely that far less people would have taken notice of it, as compared to all those who did take notice by virtue of them: being involved in the interviews and/or project group meetings; speaking to any people directly involved; or being asked for information by the author. For example, if the author had developed the model and calculated the figures alone, and then sent the results to key managers, would they have read, absorbed and understood them? And would all data have been available without the buy-in of senior managers and the project group?

The narrative will now examine what *did not* change as a result of the FCA for HE process (writing from a viewpoint of 2012).

Firstly, the intervention did not appear to alter the Campus C project in any discernable way, either at the build and fit-out stage or in the first period of use of the campus (it was occupied and used from January 2011)[130]. Alteration to build or fit-out intentions was probably not a realistic outcome however given the timing of the research project. As noted above, the design of the new campus had already been finalised and construction had begun by the time that the FCA model was developed and calculations started. By the time that the second, final draft of calculations were complete (February 2011) the campus construction had been finished, the building had been fitted out and use had commenced. (It was stated in Section 6.2.4 above that the FCA process would have had much more impact if it had been embedded into the campus project from the design stage.) For example, a key environmental feature of the building that was present at the design stage did not appear when the building was first opened, and this provides evidence of non-impact. The campus was originally designed with a large number of recycling points/bins. However, these were not installed during the final fit-out (there was some confusion as to whether this was an error of the contractors or a conscious decision by the University because of funding constraints), with the result that the campus opened with virtually no provision for staff and students to recycle paper, cardboard, plastics and tins.

Secondly, while the intervention might have affected beliefs and values, it did not do so to an extent that it changed the mission/statement of the University to

[130] The only evidence to suggest otherwise was one comment made by U8 in the first project group meeting. When this author discussed that it might be difficult to measure the influence of the dialogic process, U8 disagreed. He noted that the effect could be seen straightaway – for example, the process was informing discussions regarding printers and PCs in the new campus. (When it opened, Campus C had a limited number of group printers installed rather than one printer per member of staff which might be more environmentally friendly.)

include an explicit commitment to sustainability or a desire to become a leader in the field of sustainability (however, see May 2013 reanalysis below). Further, there is no evidence that it altered the metarules of the organisation, which appeared from comments made by interviewees to be based on financial sustainability.

Thirdly, the intervention did not lead to the adoption of an overarching sustainability strategy or system for setting sustainability targets and measuring them by University X (but again see May 2013 reanalysis below). There was no immediate indication from senior management that FCA would be used again. However, as it had been used to appraise a significant one-off building project and had not been modelled as a tool for continual appraisal of operations, one might not expect that management would look to use it again on a regular basis, unless constructing another campus building.

It is also worth reflecting as to whether participants in the project had enough time to learn and hence alter their attitudes of and perceptions towards sustainability. Participants were initially interviewed during the summer and autumn of 2008; the project group then met in January and November 2009, with calculations being given to the project group participants in November 2009 and winter 2011. Final interviews were conducted during the winter and spring of 2011. However, participants were not immersed in the project for this period and their total contact time with it could be estimated to be small – perhaps no more than two days in total given interview and meeting times, plus reading time. This could be contrasted with the case of a New Zealand water company, whose environmental (and later sustainability reports) were analysed by Tregidga & Milne (2006) for a period of ten years from 1993 to 2003 for evidence of changes in the sustainable development discourse. It was only in 2003 that some evidence of a change in perceptions towards a ‘stronger’ definition of sustainability emerged. It might therefore be concluded that University X would need to utilise FCA models for considerably longer than two days per participant in order for their effects to be felt.

Reanalysis – May 2013

This author has recently been approached (in May 2013) by U6 and a Director of Services at University X (who was not involved in the FCA for HE project) and told that his work has been discussed by a ‘Green Academy’ group that has been set up to embed sustainability across the institution and precipitate ‘whole University’ change. A summary of this thesis was requested and this author has requested to contribute to the work of a wider implementation group. The project has arisen out of the recent merger of University X with another local University. Prior to the merger, an application was made to the HEA for the new institution to be part of the Green Academy change project (a project involving ‘Green Academy’ teams in ten HE institutions across the UK). The core team driving the project forward includes two members of the FCA for HE project group, U3 and U6. The aim of the project is to embed sustainable development and ESDGC into the ‘ethos and working practices’ of the new University, changing the behaviour of staff and students. It is the intention to develop an annual report on sustainability for senior managers and governors and to report work to key stakeholders including the Funding Council and Welsh Government.

This development could be seen as a significant step that could lead to changes in interpretive schema: beliefs/values/norms, mission statement and metarules. It is not possible to deduce any causality between the FCA for HE project and the application for ‘Green Academy’ status without conducting new research, and the aforementioned merger will have introduced multiple new influences (such as the beliefs of the management of the merger partner of University X). However, given that the FCA for HE study has been discussed by the new group, it could be speculated that it must have at least had some influence.

6.4 Institutional theory

‘Barriers to entry’ for FCA were noted in Chapter 2, namely: (a) the lack of an organisational field existing around FCA; (b) no market, regulatory or legislative pressure for FCA; and (c) the fact that FCA had not become aligned with organisational norms, values, symbols and meanings, with no consistent framework for FCA codified. Alignment had not occurred because organisations had found FCA problematic; it was too uncomfortable as it problematised the status quo, and it did not fit with traditional, positivistic accounting that required accuracy and objectivity. It was speculated that FCA might not gain traction or be blocked because of these barriers (institutional inertia).

Chapter 4 noted that these barriers also applied in the HE sector. While there appeared to be a strong organisational field of HE institutions, and some evidence that a field existed around the sustainability behaviour of such institutions, no sub-field existed around FCA (it had not been applied in the sector). There was no market, regulatory or legislative pressure for FCA, and FCA represented a measurement tool that differed significantly from any norms in the sector. It was also speculated that management might not accept FCA due to it (a) challenging a ‘weak sustainability’ paradigm (and in particular the presumption that the BREEAM Excellent rating of Campus C was evidence that the campus was ‘more’, ‘relatively’ or ‘wholly’ sustainable); and (b) FCA not fitting with traditional, positivistic accounting. Given the non-alignment of FCA with these pillars/mechanisms of homogenisation, one might therefore expect institutional inertia to greet its introduction.

Per Section 6.3, FCA for HE did not lead (or at least did not immediately lead) to second-order, morphogenetic change; the institution remained in a semi-inertial state, although some change was noted. Further, the post-implementation interviews identified a minority of negative opinions towards the model and calculations. As discussed in Section 6.2 (dialogic appraisal of the process), these opinions were based on concerns over the methods of calculation, the subjectivity of figures and the way in which figures were displayed (for example, to the nearest pound). It could be speculated that these positivistic concerns were raised as a 'defensive routine' (Argyris et al., 1985). The calculations made uncomfortable reading for the managers concerned. It was noted earlier that the FCA project might have been accepted as it was hoped that it would provide an additional marketing opportunity, showcasing the sustainability credentials of the university, backing up the BREEAM Excellent rating (which had already been used for marketing purposes) and legitimating the decision to build Campus C. It may therefore have assisted in managing relationships with stakeholders. However, the FCA results challenged the status quo perception that the BREEAM rating was a 'good thing', and so provided a number of threats – a challenge to the basis for grant funding for the new building and a threat to the use of BREEAM as a marketing tool. They also did not provide an opportunity to improve relationships with stakeholders by disclosing sustainability 'good news' (as the news was not uniformally good).

In conclusion, the non-change noted might have been partially caused by non-alignment with the pillars/mechanisms and the challenge provided by FCA.

6.5 Linkage of analyses to thesis objectives

6.5.1 Evaluation of the inherent difficulties in the FCA process and feasibility given advances in knowledge and sustainability awareness

Interviewees noted various problems inherent in FCA in the post-implementation interviews – the fact that not all impacts could be measured and/or monetised, concern about causality of relationships, the difficulty of obtaining impact measurements and monetisation factors, the use of subjective figures that might change over time/a lack of accuracy in figures used, and the need to apply a model several times in different situations before a definitive view could be taken[131]. As noted above, two particular members of the project group voiced these concerns most strongly.

However, other interviewees (three in particular) appeared to recognise and accept the fact that the model would not produce a definitive account (something that had been communicated to all participants in the project at various times, including in the finding out interviews and in the final calculations report). These interviewees acknowledged that there would always be caveats and uncertainty and a willingness to live with rough, serviceable models - but that such models still added to knowledge.

It can be concluded that the current level of scientific knowledge allowed the majority of impacts to be measured and monetised (per chapter 5, Section 5.9) in a process that was acceptable to the majority of participants. Further, it can also be concluded that the level of sustainability awareness made the whole project feasible. Chapter 4 noted that participants expressed a reasonable awareness of sustainability, but also a recognition that the university needed to do much more as regards its sustainability performance. Further, they were receptive to the idea that accounting could be used to drive sustainability.

6.5.2 Evaluation of whether FCA engagements conducted in an explicitly dialogic manner lead to organisational change

As noted in Section 6.2, the application was conducted in a reasonably dialogic manner, but there were some non-dialogic motifs. The engagement (which was deemed to be educational by participants) led to some immediate change (Section 6.3) – a change in the perceptions of most participants, and a change in the mindset and practices of the organisation (the adoption of FCA for HE temporarily altered the design archetype). It is therefore possible that it started to

[131] The majority of these issues have already been noted in Chapter 3

alter organisational beliefs. Institutional theory may explain barriers that prevented further change (Section 6.4). However, removing some of the non-dialogic elements noted in the application may have helped too, and this justifies further research to run another application where these elements are not present. Recent developments (the Green Academy project) also suggest that change may still be occurring as a result of the intervention, although it is not possible to determine causality without further research.

CHAPTER 7: CONTRIBUTIONS/IMPLICATIONS, LIMITATIONS, RECOMMENDATIONS AND FINAL CONCLUSIONS

7.1 Contributions and implications of work

This thesis has been an ambitious project. It has involved the author, studying on a part-time basis: designing a dialogic approach for model building and FCA calculations; conducting a round of exploratory 'finding out' interviews; designing a revised FCA model for the HE sector (which was then honed in two meetings of a project group, chaired by the author); meeting/contacting sustainability consultants, architects and building contractors; undertaking two drafts of FCA calculations to assess the sustainability impact of a new campus project; presenting the calculations to the project group in two formal reports; and undertaking a final round of interviews and observations to gauge the impact of the whole process[132]. Most crucially, it has successfully achieved the thesis objectives – see analyses in Chapters 5 and 6[133].

The thesis has made a substantial theoretical, methodological and practical contribution to the literature. It has heeded calls for social and environmental accounting researchers to intervene directly to develop new accountings and promote practical change (chapter 2: Gray, 2010; Matthews, 1997; Parker, 2005; and Gray & Laughlin, 2012), and to measure the type of change and reasons for non-change using theoretical frameworks (Fraser, 2010; Bebbington, 2007b).

It has made a practical contribution by undertaking a new explicitly dialogic application of FCA, following calls in the literature to develop further FCA as a

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[132] The part-time nature of study crucially allowed a long enough period of time to build and use the model and conduct the 'pre' and 'post' interviews.

[133] In summary, as will be noted below, it has been found that a new dialogic version of FCA (conducted for the first time in the HE sector) has proved feasible although data problems noted in earlier applications have persisted. Further, while the application has not led to immediate second order, morphogenetic change (although the most recent evidence suggests that the impact might have been more deep-rooted than first thought), it has altered individual perceptions and the mindset and practices of the organisation, and it has had more impact than a non-dialogic application would have had (and been more feasible than a non-dialogic application would have been).

worthwhile technique to correct prices and redress the asymmetry of information found in (un)sustainability reporting, towards something that better demonstrates the (un)sustainability of an organisation's practices. The application has been deliberately dialogic in recognition of the argument that social and environmental accounting engagements incorporating dialogic motifs are more likely to engender change (Bebbington et al., 2007). The application has been a first in the HE sector. It has proved feasible given the current state of scientific knowledge and sustainability awareness. Another reasonably successful application (per chapter 5) has therefore been added to a relatively small existing literature, thus helping to improve an accounting technology seen as being in its metaphorical teenage years (chapter 2: Frame & Cavanagh, 2008). The thesis will act as an up-to-date database for new appliers, as it has summarised all relevant literature to date and identified a large number of conversion factors. Further, it has illustrated the calculations that are feasible with a limited amount of resources, and the sources of available data such as CO_2 emissions from the material component units logged by a BREEAM assessment. In chapter 6, it was noted that the 'FCA for HE' model may have significant future applicability in HE and might be of interest to a regional ESDGC centre and/or HEA ESDGC group, or as a toolkit for HE in general. However, the application has also given an updated understanding of the *impediments* surrounding FCA in general, in terms of activity and impact identification, measurement and monetisation. It has been noted that data problems prevalent in earlier applications have persisted. It has also illustrated the specific difficulties of applying FCA in the construction and HE sectors. For example, problems were noted in identifying the wider, social impacts of a university and in obtaining construction activity data from BREEAM (for example, structural materials) and conversion data (for example, the non-CO_2 impact of material component units).

Methodologically, the thesis has utilised SSM for the first time to conduct an explicitly dialogic model building and calculation process via learning for action cycles. It has been found that explicitly dialogic applications can still have non-dialogic motifs, and recommendations to reduce these will be explored below.

In terms of theory development, it has built on the work of Fraser (2010, 2012). Fraser (2010) used the DHF to gauge the dialogic nature of FCA applications. This thesis has made the framework (and analysis) richer by adding in Brown's critical dialogic principles (2009) and Bebbington et al.'s (2007) dialogic motifs. The revised framework has also been applied in a new context, being used to test the dialogic nature of the explicitly dialogic approach. Fraser (2010, 2012) also used Laughlin's organisational change framework (1991). This thesis has used it too, but has combined it with a wider framework/tools. Firstly, it has linked the organisational change framework to SSM analysis tools (the finding out analyses, and root definitions to track the development of sustainability discourse and the FCA for HE model), and SSM has been found to have a good fit with Laughlin's framework. Secondly, it has applied institutional theory to FCA in general and to sustainability behaviour (and the application of FCA) in the HE sector.

It has been found that the FCA for HE application has been broadly dialogic, but that it has suffered from some non-dialogic motifs. It has not led to immediate second order, morphogenetic change. However, it has had more impact than a non-dialogic application would have had (and been more feasible than a non-dialogic application would have been), and it has altered individual perceptions and the mindset and practices of the organisation. Specifically, the design archetype of University X was altered while the model and calculations were developed, with a significant change in the type of discourse on sustainability occurring (as modelled by comparing root definitions before and after the intervention). The most recent evidence suggests that the impact might have been more deep-rooted than first thought, and might be having a 'slow-burning' effect. Non-change might partially be due to the non-dialogic motifs noted above.

It has been noted that institutional barriers to FCA exist per se and in the public and HE sectors[134], with one potential barrier being the use of the BREEAM

[134] Barriers noted in chapter 2 were: (a) the lack of an organisational field existing around FCA; (b) no market, regulatory or legislative pressure for FCA; and (c) the fact that FCA had not become aligned with

assessment tool as it normalises an incomplete and weak sustainability paradigm. The institutional barriers may have led to inertia and non-change. The implications of these barriers for policy makers will be explored below.

In summary, the thesis has achieved what Gray & Laughlin (2012) suggested that fieldwork can achieve in this area, as it has: "…increased the understanding of the forces and impediments around adoption of social and environmental issues within organisations"; and "…offered insights into how the discourse around social and environmental issues is managed and how the 'art of the possible' can be increased at the margins" (pp. 238).

The limitations of the research will now be evaluated, and recommendations will be made that will be useful for future appliers of FCA.

7.2 Limitations of research design and execution

The design and execution of the research could have been improved in a number of ways.

Firstly, the size and scope of the project was overambitious and may have hampered both the dialogic approach and the FCA calculations. As noted in chapter 5 (Section 5.9.4), the FCA calculations were daunting. Calculations were 'sub-contracted' to the author by the project group and took up much more time than the author had anticipated. More time and manpower resource would have been helpful and would have improved the completeness and accuracy of the calculations. Per chapter 6, Section 6.2.4, due to the large amount of time spent on the calculations, communication with the project group between outputs was very limited and there were large gaps between the first and second project group meetings and the presentation of the two drafts of calculations in the

organisational norms, values, symbols and meanings, with no consistent framework for FCA codified. Alignment had not occurred because organisations had found FCA problematic; it was too uncomfortable as it problematised the status quo, and it did not fit with traditional, positivistic accounting that required accuracy and objectivity.

written reports. Two additional factors impeded communication (and hence ultimately the dialogic nature of the process and the calculations produced) - the distance between the project group members and the author, both in terms of day-to-day roles and seniority, and the fact that the project was commenced after decisions had already been made regarding the design and building of the new campus (again, see Section 6.2.4). These issues will be picked up in recommendations made below.

Secondly, the SSM model-building process was not used to its full potential. As noted in chapters 5 and 6, in the first project group meeting participants did not build separate models of purposeful activity – all time in the meeting was spent debating the impacts already in front of people in Version 2 of the FCA for HE model. While it was concluded in chapter 6 that this was not undialogic, different worldviews might have been better surfaced had individual participants built their own models first. Again, recommendations will be made below.

Thirdly, there was also a problem with 'losing people along the way', which affected the measurement of impacts and meant that conclusions were drawn from a small sample. Not all people interviewed in the 'finding out' round participated in the project group; further, three project group participants had left the University by the time that the final calculation report was issued and the post-calculation interviews were undertaken. Ideally, more effort would have been made (had time allowed) to track down these three leavers; the final calculation report should have been sent to them and interviews should have been arranged. (This was tried with one former participant but it was not possible to obtain an interview time.) People who did not agree to join the project group (and who had not received the first draft of calculations) should also have been interviewed post-intervention, to attempt to ascertain whether less contact with the project had affected their interpretation of results.

Finally, a few ‘hiccups’ affected interview data. The transcript of U12’s exploratory interview was lost and U11’s post-intervention interview was cut short due to a delayed start caused by heavy demands on U2’s time.

7.3 Recommendations to improve the ‘FCA for HE’ process

The ‘FCA for HE’ application would have benefited from a number of amendments which could have improved the calculations and boosted the dialogic nature of the overall approach, and which ultimately may have improved the influence and future take-up of the ‘FCA for HE’ model. These suggestions are set out below and should be noted by future appliers of FCA. (Note that the first, third and fourth suggestions would probably have not been feasible in the University X case due to resource constraints.)

Firstly, to improve model building, ideally the project group meetings should have been made whole day events. This would have given individual participants time to build their own models. This could have been facilitated by asking participants to fill in blank grids or worksheets, and then bringing the group together to listen to individual presentations of models and discuss an accommodating model. Such a process may have surfaced more clearly differing worldviews.

Secondly, at the project group meetings, an agreement should have been made to monetise less impacts (this was partially undertaken at the first meeting, but at the second meeting, while it was noted that it was unlikely that some impacts could be monetised, it was agreed that they would still be ‘considered’ for monetisation). A reduction of scope would have allowed for a greater focus on the remaining impacts and a narrowing of the impact/monetisation factor literature review to a more manageable size; many fruitless leads were followed that did not lead to impact/monetisation factors. Use of Bebbington et al.’s (2006) ‘bubble items’ (narrative relating to non-monetised items on the face of the SAM signature diagram) would have ensured that items that were not measured/monetised were still given equal prominence (a concern of project group participants).

Thirdly, the calculations should ideally have been produced by a team rather than solely being produced by the author, (with the team including other members of the project group). This would have allowed: faster production of figures; a thorough review and checking process of team members' work to be instigated[135]; further literature reviews to be undertaken (to calculate impacts or obtain monetisation factors); and better ownership of the calculations by the project group, improved communication and use of their skills (for example, it was noted by one participant in the post-implementation interviews that he might have been of assistance in undertaking life cycle calculations).

Fourthly, the project group would have benefitted from the inclusion of more stakeholders – such as staff and students who would be using the new campus/who were affected by the move, local residents, business representatives, city council and urban regeneration company representatives, the architects and building contractors and sustainability professionals (for example, the sustainability consultants who had been involved in the BREEAM assessment). Inclusion of more people may have added to the impacts identified, which while creating more work and contradicting recommendation 2 above, would have led to a more complete and democratic model. A wider range of stakeholders might also have assisted with data gathering and allowed further impacts to be measured and monetised. More importantly, however, they might have put pressure on management to fundamentally change priorities and acted as a check and balance against any managerial capture of the process.

Fifth, communication with the project group should have been improved. Regular updates should have been provided between meetings/presentation of drafts of calculations, and the two-way flow of information improved (i.e., regular feedback

[135] Note the errors that were made when model building in chapter 5, Section 5.1 in terms of a small number of impact headings being lost

to the team undertaking calculations would have provided better information to inform the calculations). Embedding the calculations into the wider decision-making process (which would have required that they were started at the campus design stage) would have naturally engendered increased information flows, commitment and interest. Future dialogic FCA applications should be commenced at the project design stage.

7.4 Recommendations to improve completeness and accuracy of calculations

As noted in chapter 5 Section 5.9, the 'FCA for HE' calculations suffered from issues of completeness and accuracy. Notwithstanding the recommendation in Section 7.3 above to reduce the number of impacts measured, the following recommendations might have improved the calculations. Recommendations 1-3 and 5 should be noted by future appliers of FCA.

Firstly, the calculations would have benefited from inclusion of impact data and monetisation factors from the most recent FCA applications (the 'FCA for HE' calculations were conducted without regard to the TEEB (2010), Epstein et al. (2011), Mattison et al. (2011) and PUMA (2011) applications). Table 7.1 below adds monetisation factors from these applications to those used in FCA for HE. Inclusion of these factors would have reduced the cost of particulate, NO_x, and SO_2 emissions, and increased the cost of water usage and landfill waste impacts. Further, a 'use of land' monetisation factor was obtained from the PUMA study which could have been applied to the 5.4 hectares of land on which Campus A sat (which was sold for housing development). The $C0_2$ costs used in the LCA coal, TRUCOST and PUMA studies were also below the £63.47/tonne value applied in FCA for HE. (The appropriateness of the value used was debated in chapter 5, Section 5.4.4.)

Table 7.1 – updated monetisation factors

Log of damage costs used (application/source/author):															
		Air pollution:										Waste:			Land
FCA application	**Author & date**	**Particulates**	**CO**	**NOx**	**THC**	**VOCs**	**SO_2**	**CO_2**	**CH_4**	**N_2O**	**Water**	**landfill**	**incineration**	**recycling**	**use**
		£/tonne	**£/tonne**	**£/tonne**	**£/tonne**	**£/tonne**	**£/tonne**	**£/tonne**	**£/tonne**	**£/tonne**	**£/m^3**	**£/tonne**	**£/tonne**	**£/tonne**	**£/hectare**
SAM NZ waste disposal vs recovery	Cavanagh (LCR), 2002	47378.86	0.41	889.82	444.91		2227.08	10.28	215.93	3907.37					
Australian forest management	Herbohn, 2005														
Refinement of natural gas	Antheaume, 2004														
AlcCo	Richardson & Bent, 2003			5000			5000	6							
Powergen - electricity generation	Atkinson, 2000	32150		240			485	12	80						
FCA for life-cycle of coal (elec'y gen'n)	Epstein et al, 2011							18.13							
TRUCOST (related to 2008 emissions)	Mattison et al, 2011							51.38							
PUMA (related to 2010 emissions)	PUMA, 2011 (a-j)	12883.06		1019.78		718.83	1785.90	52.59			0.70	62.77	43.85	0	298.37
Other sources:															
CWRT (quoted in Forum SAG) per ton	CWRT, 1999			315.52			268.38								
ExternE Project (quoted in Forum SAG)	Date unknown	9707.45		7622.10			5095								
ORNL (quoted in Forum SAG)	ORNL, 1995	10533.73		632.56			305.85								
Tol (2008) - average of 211 SCC figures								63.47							
Largest figure in Tol (2008) analysis								1450.68							
2012 updated averages		**22530.62**	**0.41**	**2245.68**	**444.91**	**718.83**	**2166.74**		**147.97**	**3907.37**	**0.70**	**62.77**	**43.85**	**0.00**	**298.37**
Figures used for 'FCA for HE' application (Appendix A)		***24942.51***	***0.41***	***2450.00***	***444.91***	***n/a***	***2230.22***	***63.47***	***147.967***	***3907.37***	***0.018***	***31.18***			***n/a***

Secondly, best estimates could have been published alongside low and high estimates (a method adopted in Epstein et al., 2011). This could have applied to all types of impact, not just to environmental damage costs. This may have helped to satisfy U11, who in the post-implementation interviews noted that *'probabilities and bandings could have been used to illustrate subjectivity'.*

Thirdly, avoidance/restoration costs could have been calculated for the negative impacts identified. This would have highlighted the cost to the University of mitigating the damage costs caused by the 'business as usual' mode of operation and hence would have shown the cost of reducing risk (a recurring theme in the FCA literature – see for example Rubenstein, 1994; Howes 2002 & 2003a&b; and Mattison et al., 2011) as the 'business as usual' approach might be subject to tighter government regulation in future. Calculating avoidance/restoration costs would also demonstrate the cost of pursuing more sustainable alternatives, benchmarked against current damage caused.

Fourthly, various impact data sets would have benefited from triangulation against additional sources of information. These data sets included: building demolition impacts (used for Campus A); the transport habits of staff and students (the transport survey conducted could have been considerably extended and full-time students included[136]); narrow economic impact data (this would have benefited from triangulation against latest University forecasts and involvement of Finance staff); Campus A continuation figures (for example, refurb cost and impact estimates); and various knowledge transfer outputs. Ideally, the knowledge transfer outputs would not be limited to events open to the public, performances open to the public, external sports facility usage, external library resource usage and public policy involvement. Further, the pricing of the value of the outputs would be based on the project-specific context (rather than being benefits from outputs from Scottish institutions).

[136] The emissions of full-time students were based on the over-simplistic assumption that they would all use public transport and a BREEAM transport emissions figure.

Fifth, it might have been possible to measure and monetise more impacts if more time (and the latest FCA studies) had been available. Impacts that were ultimately not measured and/or monetised included: the possible loss of biodiversity from the Campus A site when grounds were turned from parkland to housing development and any loss of biodiversity from the Campus C brownfield site; non-carbon impacts for material component units; impacts arising from Campus C usage of water, IT (non energy) and paper (including textbooks) resources and waste production during the use phase; positive resource impacts (the creation of infrastructure resources and intellectual capital); and various social impacts – the effect of the campus move on staff and students, accessibility and social exclusion, scale and agglomeration economies, the benefits of urban regeneration and the effects on staff and students of crime. One of these areas – biodiversity – will be taken forward as an illustration in the next Section.

Finally, it might have been sensible to perform a re-run of the calculations incorporating updated, in-use impact data for Campus C. This would have highlighted the accuracy of the calculations and illustrated the margin of error – which would be useful if FCA was to be used in the future as a decision-making tool. Certainly, this will have helped to satisfy U9, who noted in the post-implementation interviews that: "*if we're not careful we'll develop something that has got …… we have got some form of indicators which are based on our knowledge as we think they are today, and the whole lot might change so it might be giving us a false impression further down the line.*"; and *"Until the building is there, you don't know how people will use it. Decisions are now made reactively based on how the building is used. It is wrong to make decisions too far in advance."*

7.5 Illustration of further work possible in one example area – biodiversity impacts

A number of biodiversity impacts could have been identified and monetised for the Campus C project if more time and data had allowed. Table 7.2 highlights both direct and indirect biodiversity impacts that might have arisen from the building of Campus C and the demolition of Campus A and reuse of site, and so illustrates a hierarchical structure for the inclusion of such impacts.

Direct positive and negative impacts on biodiversity arising from the construction of Campus C could have been measured and monetised. Obviously identifiable were positive protective impacts of maintaining the flora and fauna of the Campus C site and engaging in careful construction to protect a fish species[137]. These requirements might have been able to be valued based on, for example, the willingness to pay for them – and a proxy for these values might have been the cost to the University of amending the construction design to deal with them. Further, it is feasible that construction activities would have had other direct positive and negative impacts on biodiversity, although these were not identified at the time.

Regarding the demolition of Campus A and the re-use of the site, a detailed study to measure the direct impact on the biodiversity of the site resulting from the demolition process and the building of 200 new houses was not available to this author during the FCA exercise; possibly, a rudimentary amount of work may have been undertaken as part of the planning application process for new house-building, although it is unlikely to have been extensive. Ideally, an inventory of at least all visible species would have been undertaken before any demolition works commenced, and the changes to that inventory modelled. Jones' (2003)

[137] An environmental assessment had been undertaken of the brownfield site that Campus C was to be built on, and measures were put in place to protect certain nearby flora and fauna, such as a type of 'prickly lettuce' that provided a habitat for moth species and the shad fish species that mated in the river adjacent to the construction site

<u>Table 7.2</u>: Possible direct and indirect biodiversity impacts arising from the Campus C project

<table>
<tr><th>Building and use of Campus C</th><th>Campus A - sale, demolition and re-use of site for housing</th></tr>
<tr><td>Direct impacts:</td><td>Direct impacts:</td></tr>
<tr><td>Preservation of flora and fauna of brownfield site used</td><td>Demolition – positive/negative impacts on site biodiversity</td></tr>
<tr><td>Positive impact on Shad fish species of careful construction</td><td rowspan="2">Direct impact of house-building on biodiversity / alteration of parkland and woodland surrounding old campus buildings as a result of house-building</td></tr>
<tr><td>Other direct construction impacts on biodiversity</td></tr>
<tr><td></td><td>Loss of grounds for amenity of surrounding residents</td></tr>
<tr><td colspan="2">Movement of staff and students from one site to another (suburban to urban) – alteration of amenity value.</td></tr>
<tr><td>Indirect impacts:</td><td>Indirect impacts:</td></tr>
<tr><td colspan="2">Secondary biodiversity impact of all other impacts associated with above, for example: impact of raw material extraction, processing and transport; transport impacts from use of site; consumption of utilities during construction and use.</td></tr>
</table>

‘inventory stage’ framework for the cataloguing of habitat, flora and fauna would have provided a ready-made template; certainly, identifying critical (most at risk) versus non-critical items would have been necessary. Work undertaken on a UK Biodiversity Action Plan (‘BAP’) under the UK Joint Nature Conservation Committee (‘JNCC’) has identified priority species and habitats in the UK, being those that are the most threatened and requiring conservation action. Campus A inventories gathered could have been cross-referenced against this data. BAP priority species have been identified under specific categories, with the non-marine categories being: birds; fungi; herptiles; terrestrial mammals; terrestrial invertibrates; non-vascular plants; and vascular plants (JNCC, 2012b). It is possible to identify priority species per UK country within these categories. Therefore, for example, one can see that priority bird species in Wales include the Tree Pipit, the European Nightjar, the Lesser Spotted Woodpecker, the Yellow Wagtail, the House Sparrow, the Common Starling, the Common Bullfinch and the Song Thrush (JNCC, 2012c). Priority vascular plant species include Flat-sedge, Spreading Bellflower, Cornflower, Narrow-leaved Helleborine, Chamomile, Wild Cotoneaster and Corn Buttercup (JNCC, 2012d). These may have been present at the Campus A site and affected by its change of use. Further research is now required to value specific inventories, although it could be argued that critical species have an infinite value and should not be valued (as per Jones, 2003). One also needs to be mindful of the shortcomings of ecological valuation methods as discussed in chapter 2.

One could speculate that the building of homes would lead to fragmentation of the available habitat, a diminishing of its corridor/stepping stone function not adequately replicated by the small domestic gardens that would replace it and a net loss of biodiversity. Without the suggested inventory exercise having been undertaken, it is difficult to know what may have been lost from the site on change of use. However, knowledge of the habitat and species lost might have allowed the practice of biodiversity offsetting to occur (this is a practice that is being piloted by DEFRA in England; see DEFRA, 2011a). Indeed, the University is likely to have made corresponding biodiversity gains in the last year on another campus via the setting up of allotments for students and staff.

In addition to measuring the direct biodiversity impacts, it may also have been possible to measure whether there was a change in the amenity value of the site for local residents. For example, they might have preferred to look / walk through / play in the parkland surrounding the old campus buildings in preference to looking at streets of new houses. Similarly, there may have been an effect on staff and student preferences of moving from one site to another (suburban to urban); both sites offered/offer visual examples of biodiversity, but in different forms (for example, the river-bank location of Campus C offers the opportunity to view river bird species.) The UK NEA (2011b) has noted the health benefits associated with access to urban greenspace. It might have been possible to attach a ‘loss’ per staff member and student as a result of moving from Campus A with its parkland style grounds, offset by the ‘gain’ from being adjacent to the river.

All activities noted above in Figure 7.2 could also have indirect effects on biodiversity, although these were not measured by the FCA for HE exercise. For example, the material component units used in the construction of Campus C were assessed against a wide range of impact categories by the BREEAM assessment. The extraction, processing, transport, use and ultimate disposal of these materials would feasibly have multiple impacts on biodiversity. An ideal scenario would be a BREEAM assessment that explicitly rated the impact on biodiversity of all new building projects.

7.6 Conclusions and recommendations for University X and policy makers

7.6.1 University X

The management of University X should be roundly applauded for their engagement with FCA, but, as noted in chapter 6, by the end of the application there appeared to be disappointment amongst some managers with the results obtained and a reluctance to publish fully these results. Caution should however be thrown to the wind and the nettle of full disclosure should be grasped, as well as an undertaking to continue to use the technique of FCA in the future. Motivation for these bold moves should be derived from the recent high profile adoption of FCA by PUMA. PUMA's EP&L presented uniformally bad news, in the form of environmental damages caused by the company in 2010 of 145m Euros. However, the organisation was willing to publicise these results in order to prove that it was serious about highlighting its faults and moving towards more sustainable operations, and to seek to influence its suppliers and competitors in the sports clothing/footwear industry[138]. University X[139] could take such a lead in Higher Education and would surely be rewarded for its honesty by its stakeholders.

Ontario Hydro (USEPA, 1996) identified a number of conditions necessary for FCA to be successful. Ontario Hydro, one of the early pioneers of FCA, noted that FCA should be embedded within an organisation's structures and culture, and to do this: it should be promoted as good business sense; an executive champion should be used; it should be a key part of an environmental management system; terminology should be set/agreed and data should be analysed consistently; FCA should be multi-disciplinary; and links should be developed between financial and environmental employees. They also noted that

[138] However, note the market coercive forces affecting PUMA as discussed in chapter 2 that will have persuaded it to adopt FCA. FCA was needed by it to defend its position and so adoption was not driven by purely altruistic reasons.

[139] although it is now part of a larger, merged institution

FCA should be developed and implemented slowly, and that FCA should not be the only decision-making process. It is recommended that, as a first step, consideration be given to using a fledgling EMS system adopted by the University and accredited in 2012 to undertake ongoing FCA reporting, utilizing the monetisation factors embedded in the 'FCA for HE' model. Further, 'FCA for HE' – or at very least its principles of holistically identifying sustainability impacts – should be used to assess future capital project decisions, taking into account the recommendations made in Sections 7.3 and 7.4. (It was noted in chapter 6 that there was no immediate indication from senior management that FCA would be used again. However, as it had been used to appraise a significant one-off building project and had not been modelled as a tool for continual appraisal of operations, one might not expect that management would look to use it again on a regular basis, unless constructing another campus building. The new Green Academy project might however persuade the University to revisit sustainability measurement tools. Any initiative to introduce FCA on a regular basis would therefore require development work and education as the emphasis would be different from utilising FCA to appraise a *project*.)

7.6.2 Policy makers

Chapters 4 and 6 note that if BREEAM (an incomplete environmental assessment tool per the findings of chapter 5) is accepted as a 'norm' in the HE sector, and if management believe that the organisation (or a new building) is sustainable due to a BREEAM rating, then BREEAM institutionalises weak sustainability thinking. When FCA presents an alternative heretic, strong sustainability viewpoint this might be seen as a threat by managers to the status quo, who then exhibit defensive routines. FCA struggles to gain acceptance and traction in an organisation as a result. This should be of concern to policy makers and they should therefore consider adopting much more holistic benchmarking tools that assess in much broader terms how un-sustainable an organisation's performance (or future performance) is. To counter the misconceptions driven by BREEAM, one might conceive of a rigorously expanded tool that effectively becomes a ‘BRESAM’, with the ‘Environmental’ swapped for ‘Sustainability’. As a first step such an assessment would properly assess the environmental impacts neglected by BREEAM and so would: include the impact of structural materials, fit-out materials and building contents; transparently model water usage and waste production during the use of the building and make this modelling available to the users for target-setting purposes; and realistically model transport habits of building users, based on transport surveys of current and anticipated users. Wider resource, social and economic impacts would also be included. Ideally the whole assessment would cover the impact of leaving an old building (such as demolition) as well as assessing a new build.

The negative environmental results produced by the FCA for HE model should also highlight to policy makers that a new build might not produce the environmental gains expected, especially once one expands the boundaries of the analysis and includes the impact of demolishing an old building and rebuilding on the old site. This might affect the provision of grant funding in future and alter policy towards encouraging the renovation of existing buildings. Further, they should be cognisant of the impact of users travelling to a building as compared to the environmental cost of constructing that building. This might lead to policy levers being employed to encourage the situation of new buildings in locations more accessible by public transport, and the better linkage of buildings to an improved public transport network.

It was noted in chapter 4 that no coercive/regulatory pressure existed for FCA, either in general or in the HE sector. Such pressure (for example, the requirement to use FCA to appraise new projects subject to grant funding) would begin to establish the technique as a ‘norm’. Further, resentment felt by the public sector in having to satisfy higher sustainability criteria than the private sector (or higher criteria than equivalent public sector organisations operating in areas of the country not under the jurisdiction of the same devolved governing body)[140] points to a need to standardise regulation in all parts of the public and private sectors – partly to avoid the corporate sector passing responsibility for sustainable development to the government.

Further, the Welsh Government's Sustainable Development White Paper: 'A Sustainable Wales – Better Choices for a Better Future' has proposed a Bill that will attempt to embed sustainable development in the operations and strategic thinking of all public sector organisations in Wales (see Cottam, 2013). Organisations will have a duty to consider sustainable development whenever they make strategic decisions, and they will be required to demonstrate this. This duty will have a ripple effect across the Welsh economy and beyond, 'disturbing' private sector organisations (large and small) that the public sector interacts with and procures services from. Therefore, all organisations will potentially need to consider how they embed the concept of sustainable development into decision-making and how they might develop a form of reporting that highlights their impact on the wider economy, resources, society and the environment. Full Cost Accounting conducted in a dialogic manner as per this thesis would offer a mechanism for organisations to satisfy these potential obligations.

Finally, given the difficulties noted in this thesis in gathering appropriate impact and conversion data for FCA, policy makers should also consider sponsoring the production of toolkits and/or data sets, to provide information resources and education to organisations who wish to measure their impacts but who do not have significant financial and time resources available to undertake calculations.

7.7 Further work and final reflections

There remains much to be done before FCA becomes a mature accounting technology. The 'FCA for HE' application has been a pioneering project in HE. Further applications in the sector would build data sets that could be used in

[140] These attitudes were noted in the 'finding out' interviews

multiple future applications, freeing calculators from searching for data and allowing richer dialogic accounts. The application has highlighted that in many cases, despite an increased awareness of sustainability in society at large, extensive data is still difficult to obtain – especially in relation to the social impacts that universities can have.

Given the limitations noted above with this piece of research, researchers should aim in future to conduct further FCA case studies beginning at the *project inception* stage. They should also limit the scope of their studies, seek additional resources when conducting them, involve as wide a stakeholder group as possible in impact identification and the calculations themselves, and improve the regularity of communication between all those participating. These changes would improve the dialogic nature of the process and allow the continued testing of the impact of explicitly dialogic approaches on organisational change.

This thesis has not just been a research process – it has been a step towards trying to change the views of society regarding sustainability (and the sustainability of new buildings in particular). Such exercises are urgently needed given the deteriorating indicators of planetary and social health reported at the beginning of chapter 2. Sustainability needs to become more widely understood in a societal context, and the type of inclusive, educational methodology developed and applied by this thesis is wholly necessary to do this. Wide engagement is crucial if social and environmental impacts are to be understood and responded to in a serious way. Resistance to this methodological approach proves per se that it works! The more uncomfortable the organisation becomes, the closer we might be getting to constructing a fuller picture of the actions of the organisation and the consequences of those actions in a sustainability context. However, we must always guard against the illusion of *accuracy*. As noted earlier, the 'FCA for HE' model has provided *an* account rather than *the* account of the (un)sustainability of Campus C, and this was made clear at various points to the project group. Further, the difficulties associated with quantification and monetisation should not place the whole process in a restrictive straightjacket; if items cannot be quantified, they can still be highlighted to participants and this can form an important part of the educational process.

If we continue to rely on blunt instruments such as BREEAM that effectively institutionalise un-sustainability and hoodwink society into believing that projects are legitimate and sustainable, then this will directly lead to planetary disaster and this is wholly unacceptable.

APPENDIX A: Schedules of interview questions

Table A1 – Interview questions and interviewer prompts, 'finding out' interviews

PART 1 – questions on sustainability and sustainable development

A. Interviewee perceptions of, and attitudes towards, sustainability & SD

1. How would you define sustainability and sustainable development ('SD')?

    - Do interviewees recognise:
        - the Brundtland definition of SD[141];
        - the environmental AND social aspects of sustainability (i.e. eco-efficiency and eco-justice), and so are therefore able to distinguish between 'ecological sustainability' and 'full sustainability') [note Bebbington & Gray's (2001) definition in chapter 2];
        - the economic aspects of sustainability;
        - the concepts of inter and intra-generational equity[142];
        - the notion that sustainability is a global concept (versus a narrow, organisation-level view); and
        - the difficulties inherent in determining exactly what sustainability & SD are (i.e., it has proved very difficult to precisely define sustainability, and this makes it virtually impossible to determine when a sustainable state has been reached) [note discussion including Gray (2010) in chapter 2]

2. Does your own 'worldview' of sustainability & SD differ from academic, media, sectoral (or institutional) views [which you might have expressed in Question 1]?

3. Were your perceptions of/attitudes towards sustainability and SD altered as a result of reading the e-mail (and attachment) introducing the research project and requesting this interview?

B. Sustainability and SD in the HE sector

5. How can universities contribute to SD?
    - *Expectations – interviewees note direct and indirect contributions towards SD made by HEI's through teaching and research, campus management, employment, and as protagonists in their local communities*[143]

6. What would you consider to be the main characteristics of a fully/wholly sustainable university?

7. Who are the 'sustainability' exemplars in the sector, and do you believe that they are close to reaching a 'sustainable' state?

8. Who is responsible for initiating and driving the pursuit of sustainability in the Welsh (and UK) HE sector(s) at present? (Individual universities? External parties?)

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141 **Brundtland Report definition of sustainable development:**
"…. development that meets the needs of the present, without compromising the ability of future generations to meet their own needs." (UNEP, 2007, p.7)

142 ***Inter*-generational equity:** the recognition that future generations should be no worse off than the present generation.
***Intra*-generational equity:** the recognition that all members of the present generation should be given the same opportunities, and that basic needs should be fulfilled/poverty should be eliminated.

143 These are all impacts identified in the 2008 HEFCE report 'Sustainable Development in Higher Education'

- *Expectations – interviewees may note WAG/WAG's SD strategy, HEFCW, People & Planet's 'Green League' (published in THES), University UK (note the 2007 'Greening Spires' Report and it's newly set up SD group), the UK Government's SD strategy and HEFCE (2008 report 'Sustainable Development in Higher Education', and grants for sustainability research?)*

9. Who should be responsible for initiating and driving the pursuit of sustainability in the Welsh (and UK) HE sectors?

10. What inhibits universities from acting in a more sustainable manner and/or contributing to SD?

11. What are your views of the 'Green League' published by 'People & Planet' (and reproduced in THES)? Is it taken seriously within the institution? Is the methodology used appropriate?
    - Note – universities are scored by 'People & Planet' (2008) under the following categories:
        - Environmental policy; Environmental staff; Environmental audit; Fairtrade university status; Ethical investment policy; Energy sources; Waste recycled; Carbon emissions per head; Water usage. University X were 43rd in 2008 ('2:2, must try harder') – down 21 places.

12. Should universities externally report (or report in more detail) their sustainability impacts?[144]

C. University X – current sustainability position?
D. Sustainability information systems

13. Please can I first clarify some details regarding the university environmental policy & environmental strategy, and the measurement and reporting associated with these?
    - **Note – University X has an environmental policy (signed by the VC in 2007), and an environmental strategy** that encompasses an Environmental Management System (EMS), communication and awareness, waste management, energy, transport, water, monitoring and measuring, document and operational control, records, internal auditing, non-conformance, corrective & preventive action, emergency preparedness & response, contractors, suppliers, and management review **(the Environmental Officer prepares a report that is approved by the 'Finance Employment Policy & General Purpose Committee') .**
    - **Clarify the measurement and reporting that occurs. What is reported, and who sees this. [It may be appropriate to ask about sustainability/SD measurement & reporting here]**
    - The original strategy had a 5 year duration, with the fifth year being 2007/08. Is a new or amended strategy being put in place for 2008/09 onwards?

14. How successful has the environmental strategy implemented by University X been?
    - Five year reduction targets were set in a number of areas – waste, water usage, energy

15. Does the university have a formal sustainability strategy? If yes, how is it measured and reported?

    - How, specifically, is information on sustainability/SD measured, reported and acted upon at University X?
    - Are SD targets set?

[144] In the 2006/07 Annual Report of University X, a section entitled 'Building For The Future' discussed the chipfat biodiesel facility, the constant addition of environmentally friendly measures (such as passive infra-red lighting sensors and urinal flush controls), and the eco-friendly design features of the a new campus building (such as solar shades on the south-facing side, rainwater collection and a state-of-the-art efficient heating system). It also described the recycling record of University X (without comparatives). Other sections of the report highlighted the role of University X as a community university, and discussed equality and diversity.

- What sustainability information is received by the Management Board and the Board of Governors?
- Are SD assessment criteria applied to individual projects? [NB – Campus C is undergoing a BREEAM assessment]
- Who is responsible for SD decision-making? Is there a 'SD champion'? **[Note – the University has an Environmental Officer]**
- Could the sustainability information produced be improved?

16. How sustainable do you believe University X to be at present? What 'sustainability gap', if any, do you perceive to exist? **[Note – the 'sustainability gap' refers to the gap between the current position and a position that could be described as being fully/wholly sustainable]**. What information is your assessment based on?

17. How sustainable will Campus C be? What information is your assessment based on?

18. To what extent did sustainability concerns inform the design of Campus C, and why? **[Note – BREEAM 'Excellent' rating required as a pre-requisite of grant funding]**

19. How important is it for University X to be fully/wholly sustainable in the future? Why is this important?*

20. What pressures exist on University X to be more sustainable and bridge the 'sustainability gap'? Are there particular stakeholders who are exerting pressure?

21. If a sustainability gap exists at University X, what changes/actions are required to bridge the gap?*

22. Over what timescale could the changes suggested be implemented? Is it planned that all of these changes will be implemented?*
    - *Are there differences between the personal preferences of interviewees, and the management realities that they face?*

***** ***NB: These questions tended not to be asked given answers that were given prior to this point***

PART 2 – questions on accounting and sustainability

1. Can accounting be used to drive sustainability?

2. **Interviewer to introduce FCA and the 'FCA for HE' model (by presenting and talking through a fact-sheet for FCA and presenting the 'FCA for HE' model), noting that the interview request/project introduction e-mail has already outlined FCA and the 'FCA for HE' model**

3. What are your initial views on FCA (and the 'FCA for HE' model)?

4. **Interviewer to clarify project methodology and timescale (by presenting and talking through a project summary)**

5. Would you be prepared to take part in a 'FCA project group'? (Interviewer to gather any views on action research and soft systems methodology)

6. Are you happy to be re-interviewed at the end of the project?

7. Who else should I speak to? [I will be interviewing various members of the Management Board, the Environmental Officer etc, and gathering data from sustainability consultants, architects, building contractors etc]

Table A2 – **interview prompts for post-intervention interviews**

1. Development of FCA for HE model

A. Has the model development process (i.e., initial interviews and project group) been participatory and democratic?
B. Have you felt 'part' of the process?
C. Has the process been effective for developing a sustainability measurement model?
D. Has the process been educational?
E. Has your involvement in the process altered the impact that the results of the model have had on you?
F. Could the process have been improved? If so, how?

2. Views on final 'FCA for HE' model and results

A. Is the model clear and understandable?
B. Have the correct impacts been identified?
C. Should any additional impacts have been identified?
D. What are your views on the monetisation of the impacts?
E. Does the model provide a reliable measure of sustainability?
F. Does it provide a holistic measure of sustainability?
G. Overall, is the model an effective tool to measure sustainability?
H. Could the model be improved further?
I. According to the results, is Campus C more or less sustainable than you were expecting?
J. What are your views on the negative environmental and resource impacts?
K. Have you any comments on any of the other impacts?

3. Impact of process, model and results

A. Have your perceptions of sustainability been materially altered as a result of participating in the development process and/or viewing the results of the model?
B. Have decisions made and actions taken been altered (or will they be altered) as a result of participating in the development process and/or viewing the results of the model (i.e., has it altered behaviour)?

APPENDIX B: Chapter 5 Tables, Figures & Workings

Table B1 – Campus C stand-alone sustainability impacts (average social cost of carbon)

		Environ-mental (£)	Resource (£)	Social (£)	Economic (wide) (£)	Economic (narrow) (£)
Cons'n:	Direct construction ex're					**28,000,000**
	Other monies paid to contractors etc					**7,000,000**
	Misc. project expenditure					**4,000,000**
	Opportunity cost of resources consumed		**-7,661,500**			
	Creation of infrastructure resources		Not avail.			
	Pollution impact of cons'n materials	**-618,163**				
	Pollution impact of 'fit-out' materials	**-248,823**				
	Pollution - utilities used in construction	**-25,376**				
	Pollution - construction waste	**-714**				
	Pollution - demolition of Campus A	**-66,581**				
	Impact of housebuilding on Campus A site	**-1,695,080**				
Use:	Returns paid to providers of finance					**8,881,058**
	Misc. operating ex're					**74,083,037**
	Monies paid to employees					**126,784,276**
	Other campus gains/losses					**-4,161,453**
	Multiplier effects - campus income				**337,529,948**	
	Multiplier effects - Int. student ex're				**10,567,059**	
	Knowledge transfer outputs			**2,517,569**		
	Opportunity cost - energy resources		**-896,623**			
	Creation of intellectual capital		Not avail.			
	Pollution - gas, electric	**-280,722**				
	Pollution - water	Not avail.				
	Pollution - waste	Not avail.				
	Pollution - IT (non-energy)	Not avail.				
	Pollution - paper (incl. library books)	Not avail.				
Location:	Opp. cost - resources used in transport		**-45,101,542**			
	Pollution - transport	**-7,861,906**				
	Effect of campus move on staff & students			Not avail.		
	Accessibility & social exclusion			Not avail.		
	Scale & agglomeration economies			Not avail.		
	Benefits of urban regeneration			Not avail.		
	Effect on staff & students of crime			Not avail.		
		-10,797,364	**-53,659,665**	**2,517,569**	**348,097,007**	**244,586,919**

<u>Figure B1</u> – Campus C stand-alone sustainability impacts (graphical; average social cost of carbon)

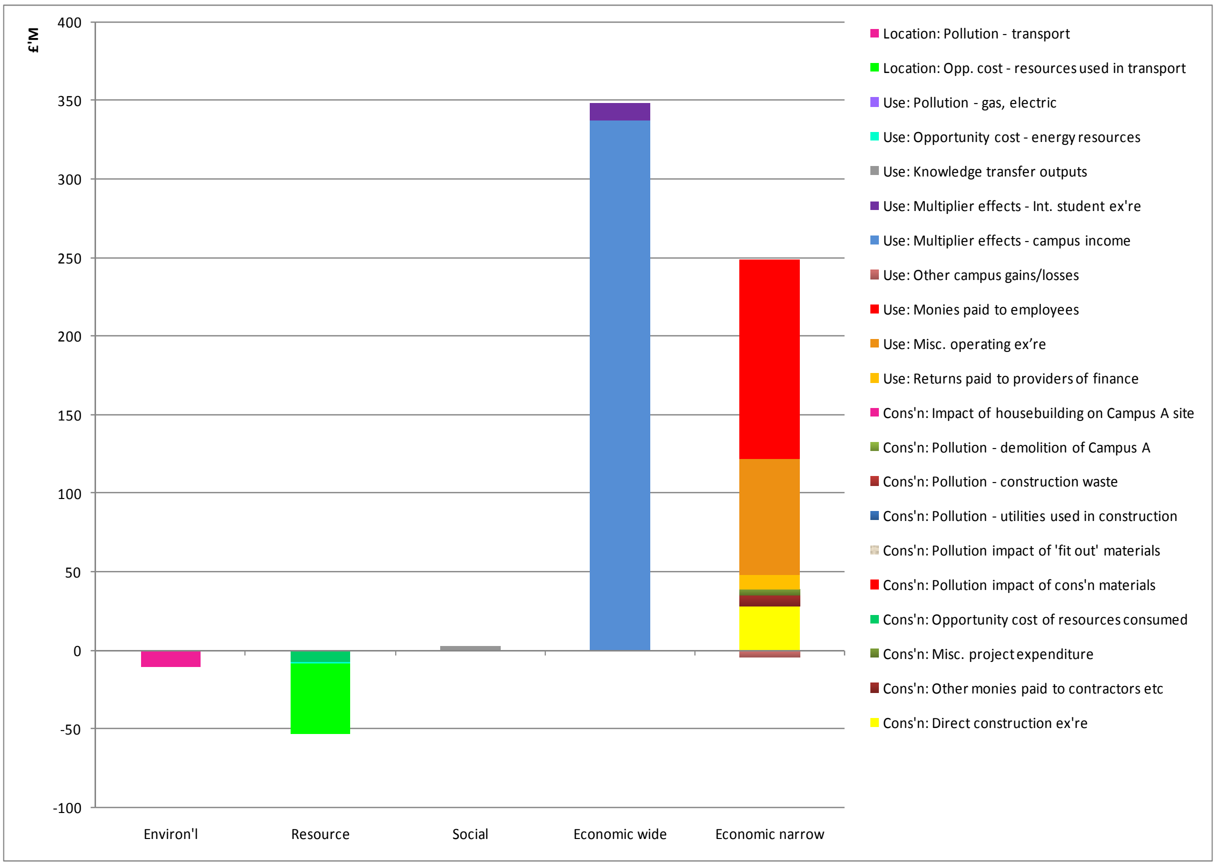
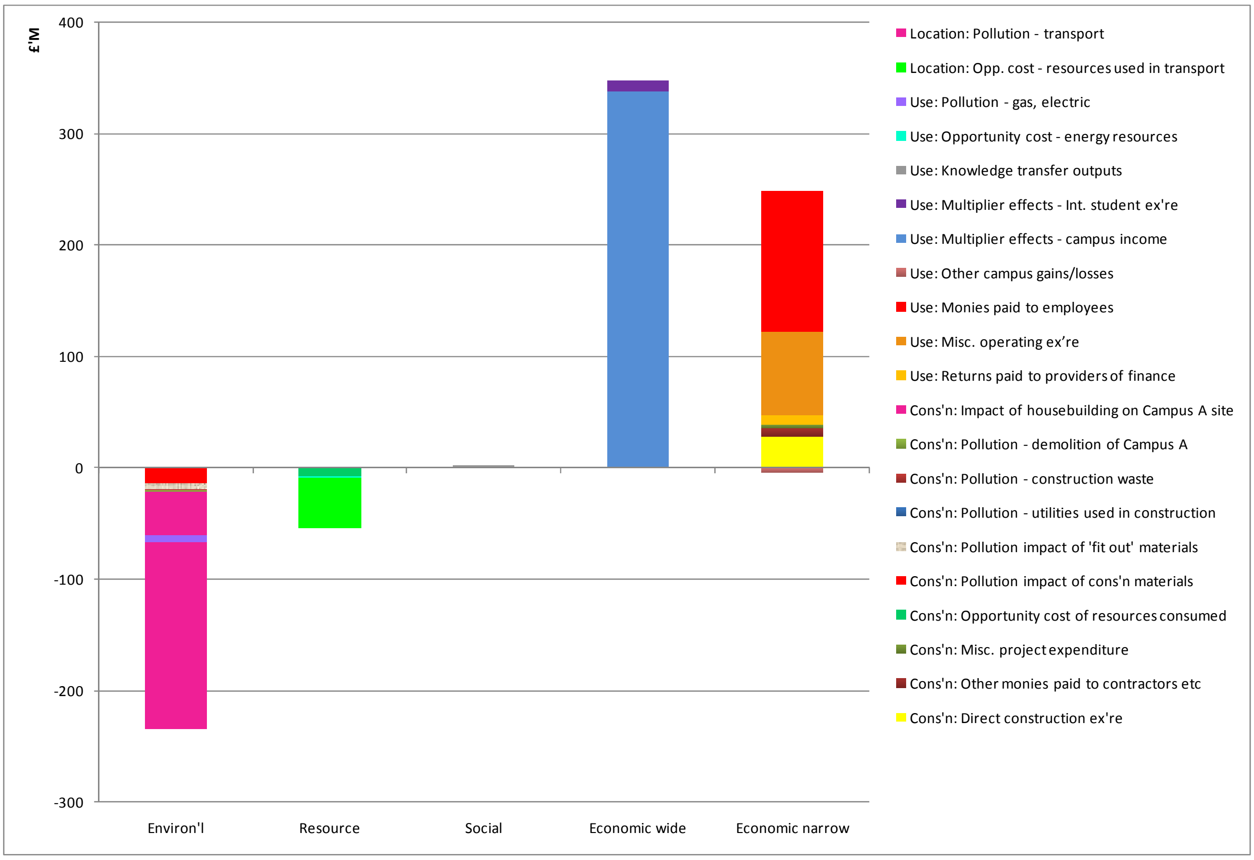


Table B2 – Campus C stand-alone sustainability impacts (highest social cost of carbon).

		Environ-mental (£)	Resource (£)	Social (£)	Economic (wide) (£)	Economic (narrow) (£)
Cons'n:	Direct construction ex're					**28,000,000**
	Other monies paid to contractors etc					**7,000,000**
	Misc. project expenditure					**4,000,000**
	Opportunity cost of resources consumed		**-7,661,500**			
	Creation of infrastructure resources		Not avail.			
	Pollution impact of cons'n materials	**-13,830,279**				
	Pollution impact of 'fit-out' materials	**-5,687,379**				
	Pollution - utilities used in construction	**-580,028**				
	Pollution - construction waste	**-16,311**				
	Pollution - demolition of Campus A	**-1,521,847**				
	Impact of housebuilding on Campus A site	**-38,744,681**				
Use:	Returns paid to providers of finance					**8,881,058**
	Misc. operating ex're					**74,083,037**
	Monies paid to employees					**126,784,276**
	Other campus gains/losses					**-4,161,453**
	Multiplier effects - campus income				**337,529,948**	
	Multiplier effects - Int. student ex're				**10,567,059**	
	Knowledge transfer outputs			**2,517,569**		
	Opportunity cost - energy resources		**-896,623**			
	Creation of intellectual capital		Not avail.			
	Pollution - gas, electric	**-6,416,504**				
	Pollution - water	Not avail.				
	Pollution - waste	Not avail.				
	Pollution - IT (non-energy)	Not avail.				
	Pollution - paper (incl. library books)	Not avail.				
Location:	Opp. cost - resources used in transport		**-45,101,542**			
	Pollution - transport	**-168,039,955**				
	Effect of campus move on staff & students			Not avail.		
	Accessibility & social exclusion			Not avail.		
	Scale & agglomeration economies			Not avail.		
	Benefits of urban regeneration			Not avail.		
	Effect on staff & students of crime			Not avail.		
		-234,836,984	**-53,659,665**	**2,517,569**	**348,097,007**	**244,586,919**

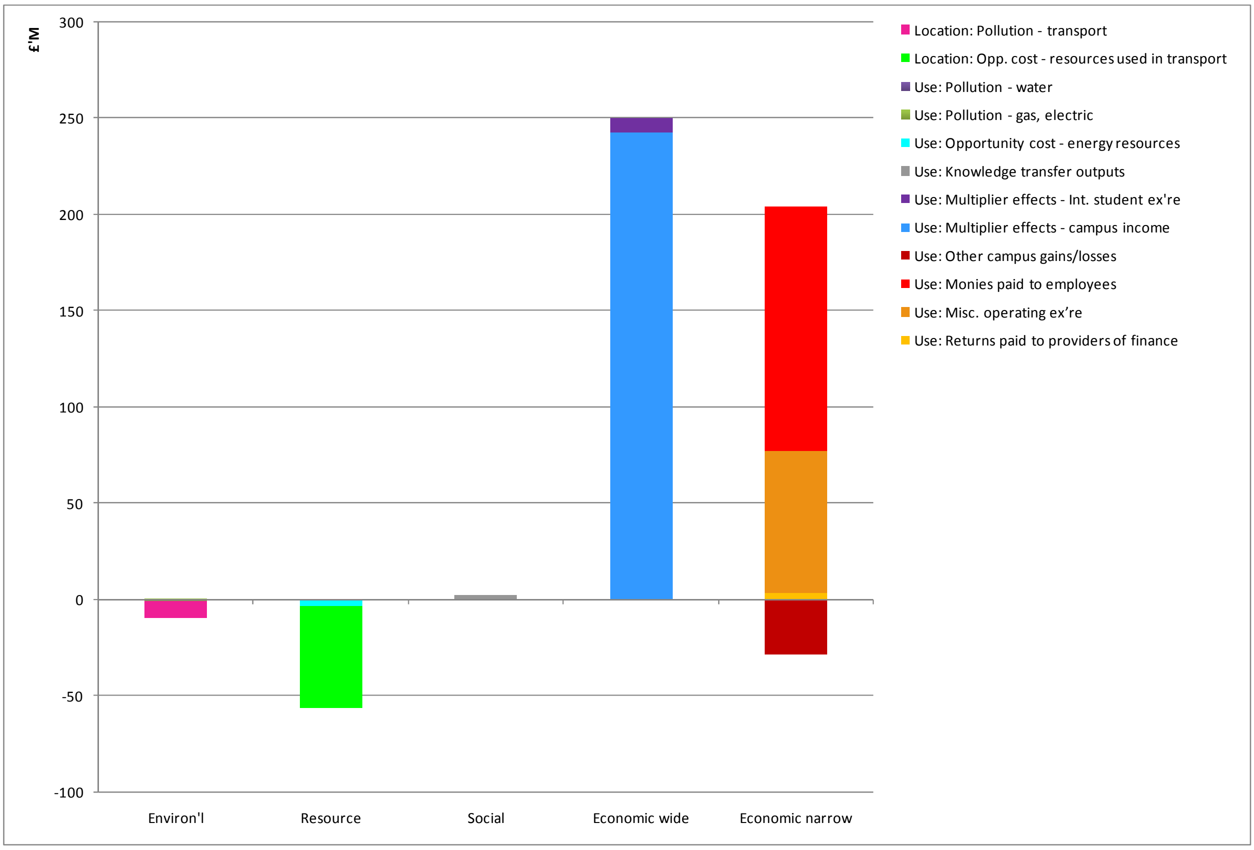
<u>Figure B2</u> – Campus C stand-alone sustainability impacts (graphical; highest social cost of carbon)



<u>Table B3</u> – Campus A hypothetical sustainability impacts assuming no eco-refurb (average social cost of carbon)

		Environ-mental (£)	Resource (£)	Social (£)	Economic (wide) (£)	Economic (narrow) (£)
Use:	Returns paid to providers of finance					**3,408,862**
	Misc. operating ex're					**74,083,037**
	Monies paid to employees					**126,784,276**
	Other campus gains/losses					**-28,384,165**
	Multiplier effects - campus income				**242,730,973**	
	Multiplier effects - Int. student ex're				**7,313,746**	
	Knowledge transfer outputs			**1,947,162**		
	Opportunity cost - energy resources		**-3,712,087**			
	Pollution - gas, electric	**-1,162,210**				
	Pollution - water	**-18,273**				
	Pollution - waste	Not avail.				
Location:	Opp. cost - resources used in transport		**-52,367,620**			
	Pollution - transport	**-8,342,541**				
		-9,523,024	**-56,079,707**	**1,947,162**	**250,044,719**	**175,892,009**

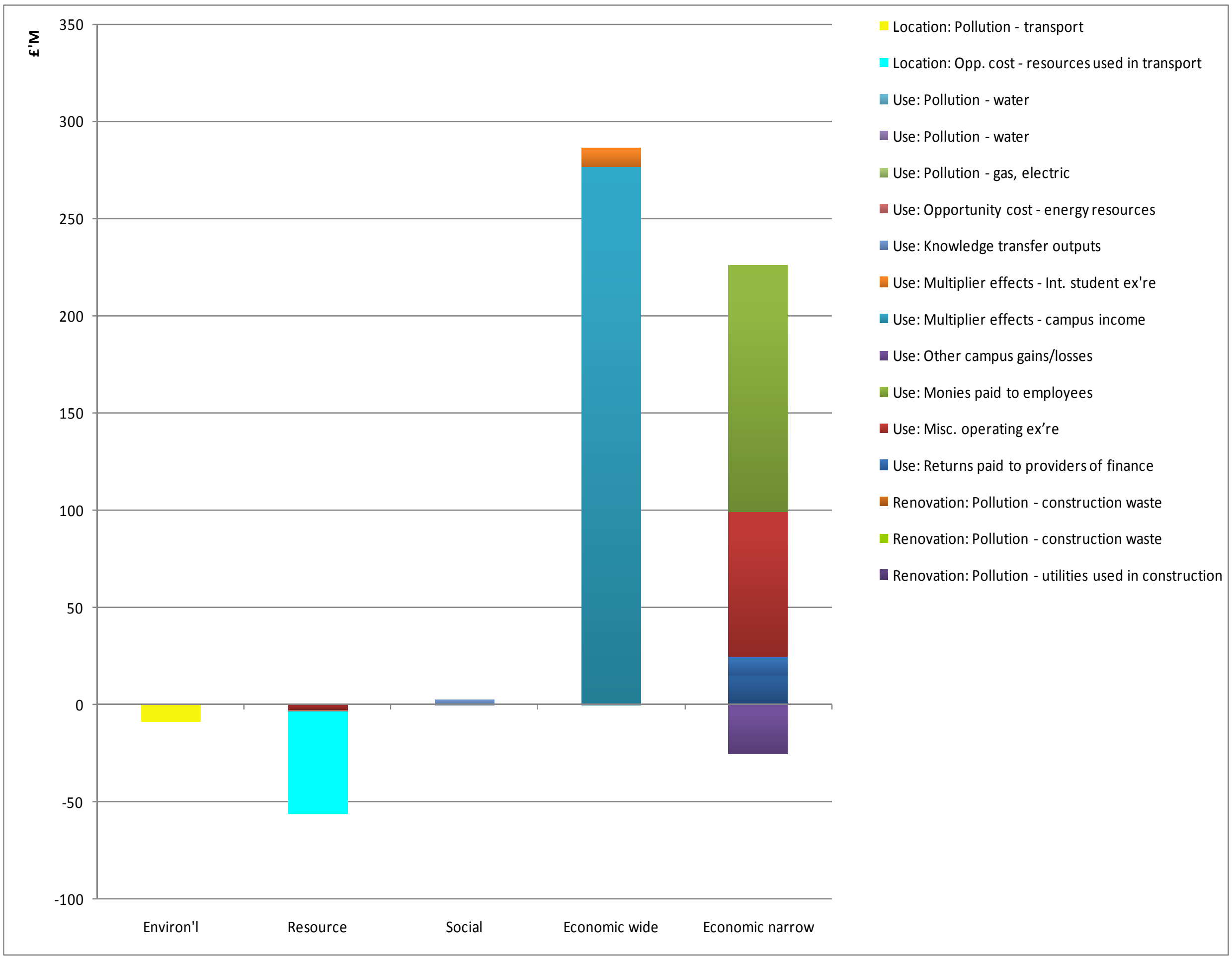
<u>Figure B3</u> – Campus A hypothetical sustainability impacts assuming no eco-refurb (graphical; average social cost of carbon)



<u>Table B4</u> – Campus A hypothetical sustainability impacts assuming eco-refurb (average social cost of carbon)

		Environ-mental (£)	Resource (£)	Social (£)	Economic (wide) (£)	Economic (narrow) (£)
Renovation:	Renovation ex're					**15,000,000**
	Opportunity cost of resources consumed		**-2,946,731**			
	Pollution impact of refurb materials	**-333,456**				
	Pollution - utilities used in construction	**-9,760**				
	Pollution - construction waste	**-274**				
Use:	Returns paid to providers of finance					**9,800,478**
	Misc. operating ex're					**74,083,037**
	Monies paid to employees					**126,784,276**
	Other campus gains/losses					**-25,239,353**
	Multiplier effects - campus income				**276,591,243**	
	Multiplier effects - Int. student ex're				**9,411,228**	
	Knowledge transfer outputs			**2,218,786**		
	Opportunity cost - energy resources		**-742,417**			
	Pollution - gas, electric	**-232,442**				
	Pollution - water	**-3,655**				
	Pollution - waste	Not avail.				
Location:	Opp. cost - resources used in transport		**-52,367,620**			
	Pollution - transport	**-8,342,541**				
		-8,922,128	**-56,056,768**	**2,218,786**	**286,002,471**	**200,428,437**

<u>Figure B4</u> – Campus A hypothetical sustainability impacts assuming eco-refurb (graphical; average social cost of carbon)

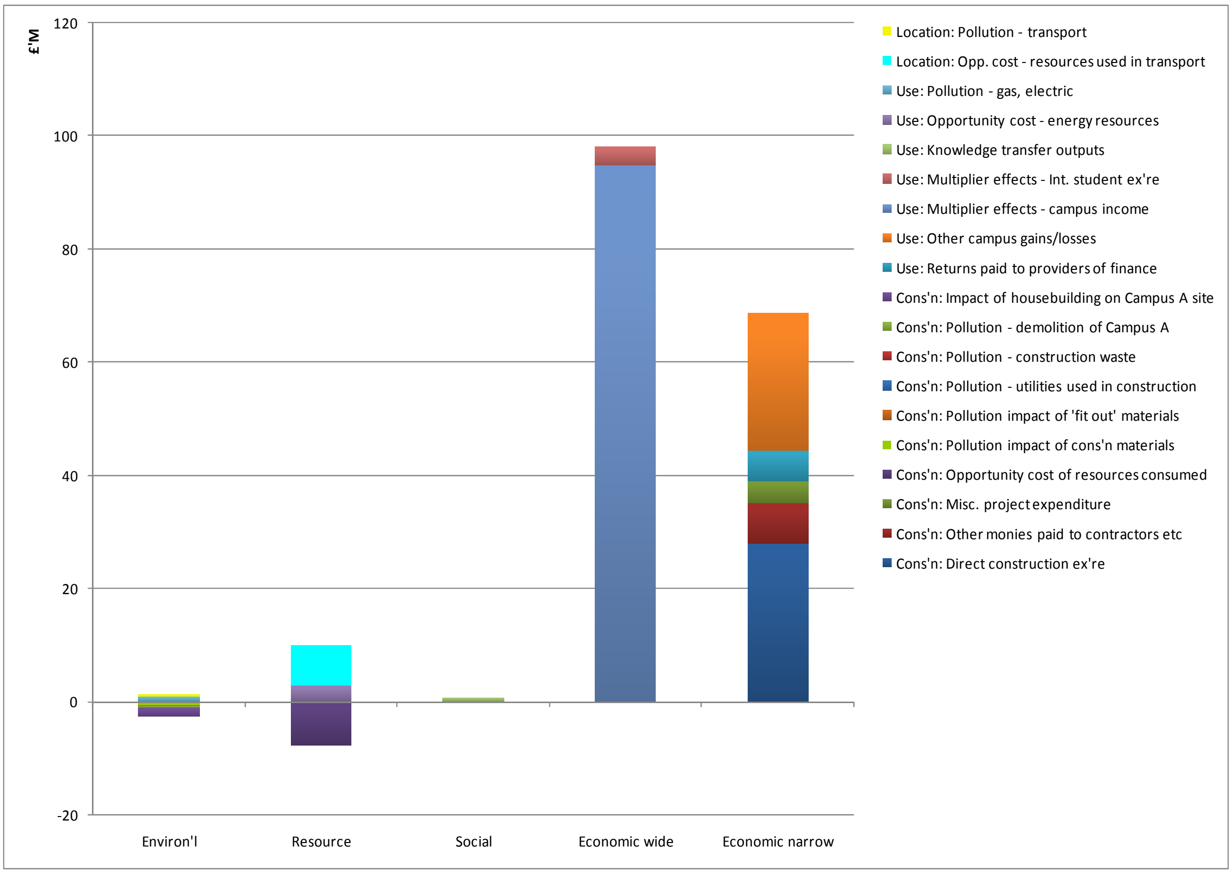


<u>Table B5</u> – Campus C incremental impacts (versus hypothetical Campus A impacts assuming no eco-refurb; average social cost of carbon)

		Environ-mental (£)	Resource (£)	Social (£)	Economic (wide) (£)	Economic (narrow) (£)
Cons'n:	Direct construction ex're					**28,000,000**
	Other monies paid to contractors etc					**7,000,000**
	Misc. project expenditure					**4,000,000**
	Opportunity cost of resources consumed		**-7,661,500**			
	Creation of infrastructure resources		Not avail.			
	Pollution impact of cons'n materials	**-618,163**				
	Pollution impact of 'fit-out' materials	**-248,823**				
	Pollution - utilities used in construction	**-25,376**				
	Pollution - construction waste	**-714**				
	Pollution - demolition of Campus A	**-66,581**				
	Impact of housebuilding on Campus A site	**-1,695,080**				
Use:	Returns paid to providers of finance					**5,472,197**
	Misc. operating ex're					**0**
	Monies paid to employees					**0**
	Other campus gains/losses					**24,222,713**
	Multiplier effects - campus income				**94,798,975**	
	Multiplier effects - Int. student ex're				**3,253,313**	
	Knowledge transfer outputs			**570,407**		
	Indirect education benefits			Not avail.		
	Opportunity cost - energy resources		**2,815,464**			
	Creation of intellectual capital		Not avail.			
	Pollution - gas, electric	**881,488**				
	Pollution - water	Not avail.				
	Pollution - waste	Not avail.				
	Pollution - IT (non-energy)	Not avail.				
	Pollution - paper (incl. library books)	Not avail.				
Location:	Opp. cost - resources used in transport		**7,266,078**			
	Pollution - transport	**480,635**				
	Effect of campus move on staff & students			Not avail.		
	Accessibility & social exclusion			Not avail.		
	Scale & agglomeration economies			Not avail.		
	Benefits of urban regeneration			Not avail.		
	Effect on staff & students of crime			Not avail.		
		-1,292,613	**2,420,042**	**570,407**	**98,052,288**	**68,694,910**

It should be noted that the construction phase impacts in Table B5 above are the same as those in Table B1. The use and location phase impacts have been calculated as the difference between Campus C absolute impacts (Table B1) and theoretical Campus A impacts (Table B3).

<u>Figure B5</u> – Campus C incremental impacts (versus hypothetical Campus A impacts assuming no eco-refurb) – graphical (average social cost of carbon)



<u>Table B6</u> – Campus C incremental impacts (versus hypothetical Campus A assuming eco-refurb; average social cost of carbon)

		Environ-mental (£)	Resource (£)	Social (£)	Economic (wide) (£)	Economic (narrow) (£)
Cons'n:	Incremental ex're - new cons'n vs refurb					**24,000,000**
	Multiplier effects - building ex're				Not applic'l	
	Opportunity cost of resources consumed		**-4,714,769**			
	Creation of infrastructure resources		Not avail.			
	Pollution impact of materials used	**-533,530**				
	Pollution - utilities used in construction	**-15,616**				
	Pollution - construction waste	**-439**				
	Pollution - demolition of Campus A	**-66,581**				
	Impact of housebuilding on Campus A site	**-1,695,080**				
Use:	Returns paid to providers of finance					**-919,419**
	Misc. operating ex're					**0**
	Monies paid to employees					**0**
	Other campus gains/losses					**21,077,901**
	Multiplier effects - campus income				**60,938,705**	
	Multiplier effects - Int. student ex're				**1,155,832**	
	Knowledge transfer outputs			**298,784**		
	Opportunity cost - energy resources		**-154,206**			
	Creation of intellectual capital		Not avail.			
	Pollution - gas, electric	**-48,280**				
	Pollution - water	Not avail.				
	Pollution - waste	Not avail.				
	Pollution - IT (non-energy)	Not avail.				
	Pollution - paper (incl. library books)	Not avail.				
Location:	Opp. cost - resources used in transport		**7,266,078**			
	Pollution - transport	**480,635**				
	Effect of campus move on staff & students			Not avail.		
	Accessibility & social exclusion			Not avail.		
	Scale & agglomeration economies			Not avail.		
	Benefits of urban regeneration			Not avail.		
	Effect on staff & students of crime			Not avail.		
		-1,878,891	**2,397,103**	**298,784**	**62,094,536**	**44,158,482**

Figure B6 – Campus C incremental impacts (versus hypothetical Campus A impacts assuming eco-refurb) – graphical (average social cost of carbon)

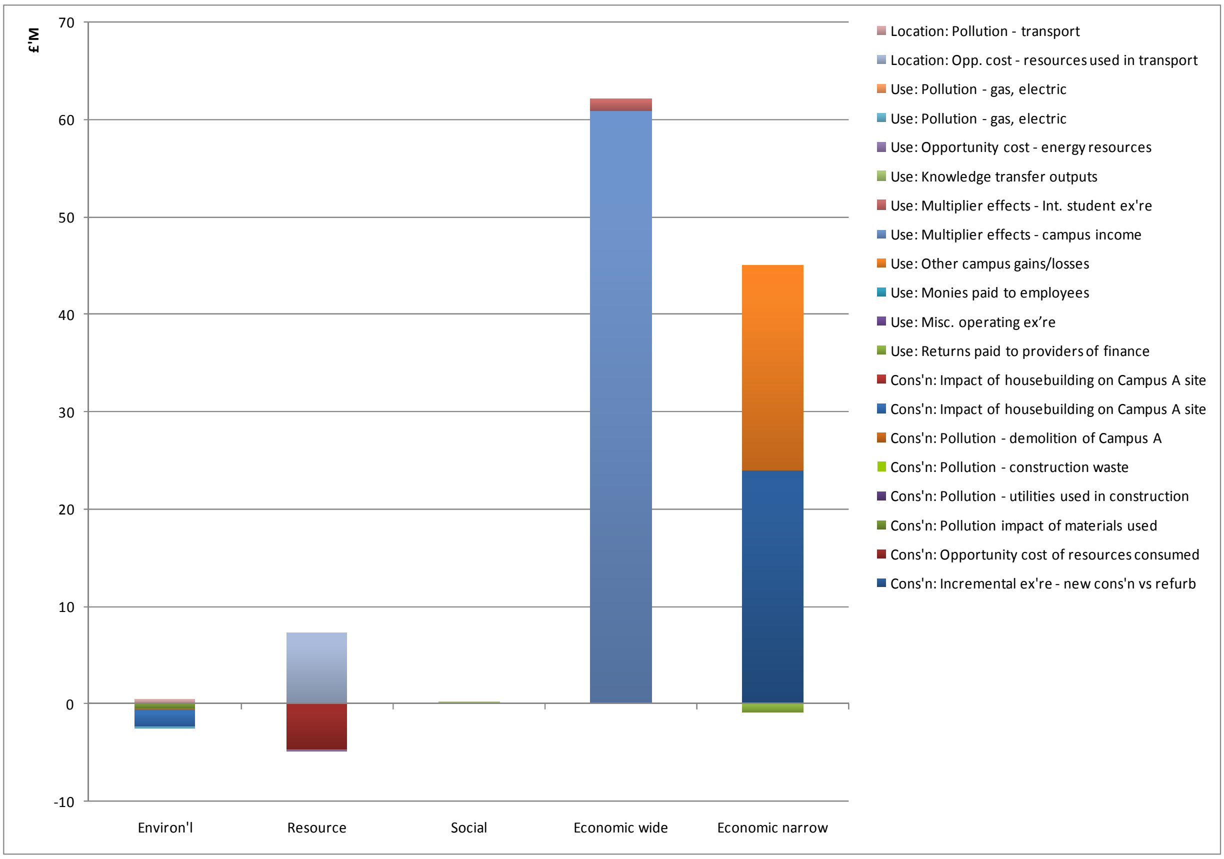


Table B7 – Summary of conversion factors used – construction phase

CAUSE OF CONSTRUCTION IMPACTS:	Data obtained from:	Data units:	Value:	Type of impact/value of conversion factor (tonnes per unit of activity): CO_2 t	CO t	SO_2 t	NO_X t	Hydro-carbons t	Particulates t	Notes on conversion factors: (NB for more detail see Section 5.4.2)
Structural materials used:										
Steel	Quantity Surveyor ('QS')	tonnes	1599	1.9	N/a	N/a	N/a	N/a	N/a	Embodied CO_2 cradle to gate. Average figure obtained from Worldsteel (2009) after comparison with a number of industry and academic sources.
Concrete	QS	m^3	4489	0.335	N/a	0.000273	0.00066	N/a	0.000033	CO_2 = embodied CO_2 of average concrete mixes, cradle to gate (Sustainable Concrete, 2009). SO_2, NO_X & Particulates - based on emissions from cement manufacture (Sustainable Concrete 2009 & British Cement Association 2007 & 2008).
Material 'components' per BREEAM assessment:										
External walls:										
Timber cladding	BREEAM ass't	Area (m^2)	300	0.03	N/a	N/a	N/a	N/a	N/a	Conversion factors all obtained by comparing material
Brick	BREEAM, QS rev	"	1087	0.074	N/a	N/a	N/a	N/a	N/a	component unit categories from BREEAM assessment [which
Metal louvres	BREEAM ass't	"	137	N/a	N/a	N/a	N/a	N/a	N/a	was based on 3rd Edition of the 'Green Guide to
Zinc cladding	BREEAM ass't	"	1300	0.046	N/a	N/a	N/a	N/a	N/a	Specification' (Anderson et al 2002)] with 4th Edition of
Roofing:										Green Guide (Anderson & Shiers, 2009).
Aluminium roof	BREEAM ass't	"	4180	0.11	N/a	N/a	N/a	N/a	N/a	Some categories did not correlate directly; categories
Underside cedar cladding	BREEAM, QS rev	"	3935	0.03	N/a	N/a	N/a	N/a	N/a	with similar descriptions were matched.
Upper floor slabs:										It was not possible to do this for *metal louvres.*
Upper floor terraces	BREEAM, QS rev	"	1050	0.123	N/a	N/a	N/a	N/a	N/a	Only embodied CO_2 data was published publicly in the 4th
Concrete floor slabs	BREEAM ass't	"	10500	0.123	N/a	N/a	N/a	N/a	N/a	Edition.
Windows:										
Proprietary composite timber / metal frame	BREEAM ass't	"	260	0.14	N/a	N/a	N/a	N/a	N/a	
Proprietary aluminium frame windows	BREEAM ass't	"	432	0.14	N/a	N/a	N/a	N/a	N/a	
Glazed curtain walling system	BREEAM ass't	"	2465	0.17	N/a	N/a	N/a	N/a	N/a	
Glazed frameless curtain walling system	BREEAM ass't	"	77	0.17	N/a	N/a	N/a	N/a	N/a	
Internal walls:										
Masonary, plaster/plasterboard	BREEAM ass't	"	13500	0.046	N/a	N/a	N/a	N/a	N/a	
Floor finishes/covering:										
Entrance matting	QS	"	19.38	N/a	N/a	N/a	N/a	N/a	N/a	No conversion factors found.
Sprung timber floor	QS	"	167	N/a	N/a	N/a	N/a	N/a	N/a	
Vinyl flooring	QS	"	60.91	N/a	N/a	N/a	N/a	N/a	N/a	
Marmoleum flooring	QS	"	1463.77	0.00279	N/a	N/a	N/a	N/a	N/a	CO2 Factors derived from data from: Jonsson, Tillman & Svenson (1997).
Rubber flooring	QS	"	1013.26	0.00798	N/a	N/a	N/a	N/a	N/a	
Unknown - assume carpet	QS	"	391	0.106	N/a	N/a	N/a	N/a	N/a	Hacker et al (2008).
Carpet	QS	"	8022.72	0.106	N/a	N/a	N/a	N/a	N/a	
Exterior - hard landscaping & boundary protection area:										
A-rated material (natural stone slab; assumed sandstone)	QS	"	3802.8	0.18	N/a	N/a	N/a	N/a	N/a	As above for material component categories.
Non A-rated material (assumed asphalt)	QS	"	947.5	0.1	N/a	N/a	N/a	N/a	N/a	

Table B7 (continued) – Summary of conversion factors used – construction phase

CAUSE OF CONSTRUCTION IMPACTS:	Data obtained from:	Data units:	Value:	Type of impact/value of conversion factor (tonnes per unit of activity): CO_2 t	CO t	SO_2 t	NO_X t	Hydro-carbons t	Particulates t	Notes on conversion factors: (NB for more detail see Section 5.4.2)
Internal fit-out materials	Detailed inventory not available at time of FCA study. Therefore assump'ns: (1) Embodied energy from fit-out approx. 1/3 of total cons'n embodied energy (Arnold, 2004 - services and finishes typically take up approx 1/3 of a chart depicting GJ/m^2 of initial embodied energy for office buildings, as opposed to the structure, envelope and other construction of the building). (2) 1/3 of embodied energy equates to 1/3 of total carbon impact. Total carbon impact of construction (impacts above, excl. flooring, plus hard landscaping) = 7,840.955 tonnes of CO_2. Therefore estimated additional fit-out carbon impact = 7,841/2 = 3,920.5. See Section 6.4.2									
Utilities consumed:										
Electricity	Building Con'r En'l Off'r (BCEO) & estimates	kWh	202973.3	0.000542	N/a	N/a	N/a	N/a	N/a	Conversion factor obtained from DEFRA (2009).
Water	BCEO & ests	m^3	1336.5	0.000276	N/a	N/a	N/a	N/a	N/a	Conversion factor obtained from DEFRA (2009).
Diesel	BCEO & ests	Litres	272406.09	0.00025	N/a	N/a	N/a	N/a	N/a	Total CO_2 figure for known period provided by BCEO.
Waste:										
Inert (assuming soil and stones)	BCEO	m^3 to tonnes	Multiple	Multiple	N/a	N/a	N/a	N/a	N/a	Initial figures for waste produced to date obtained from
Metals	"	"	"	"	N/a	N/a	N/a	N/a	N/a	BCEO-supplied data sheets. Figures in m^3.
Office/canteen	"	"	"	"	N/a	N/a	N/a	N/a	N/a	Initial m^3 figures converted to tonnes using WRAP (2009)
Timber	"	"	"	"	N/a	N/a	N/a	N/a	N/a	conversion factors.
Liquids & oils (assume fuel oil and diesel?)	"	"	"	"	N/a	N/a	N/a	N/a	N/a	Split between 'sent to landfill' or 'diverted' according to
Packaging (assumed plastic)	"	"	"	"	N/a	N/a	N/a	N/a	N/a	BCEO % data.
Plaster (Gypsum conversion factor used)	"	"	"	"	N/a	N/a	N/a	N/a	N/a	CO_2 conversion factors for both types of waste stream
Plastics	"	"	"	"	N/a	N/a	N/a	N/a	N/a	obtained from DEFRA.
Timber	"	"	"	"	N/a	N/a	N/a	N/a	N/a	Final cost figures pro-rata'ed to obtain estimate for
										whole construction period.
Redevelopment of greenfield site:										
Impact of demolition of Campus A	University En'l Officer (UEO)	Area (m^2)	13,113	0.08	N/a	N/a	N/a	N/a	N/a	Carbon impact of demolition taken from earlier LCA study of an office building. Athena Sustainable Materials Institute (2009).
Impact of new homes built on Campus A site	University Dir'r of Estates (UDE)	No. of new homes	200	Multiple	N/a	N/a	N/a	N/a	N/a	CO2 conversion factors for building, using and maintaining medium-weight homes (20 year period). Adapted from Hacker et al (2008).

Table B8 – Summary of conversion factors used – use & location phases

CAUSE OF USE & LOCATION IMPACTS:	Data obtained from:	Data units:	Value:	Type of impact/value of conversion factor (tonnes per unit of activity): CO$_2$ t	CO t	SO$_2$ t	NO$_X$ t	Hydro-carbons t	Particulates t	Notes on conversion factors: (NB - for more detail see Sections 5.4.4 and 5.4.5)
Energy consumed Campus C	BREEAM ass't	Area (m^2)	12085	0.0183	N/a	N/a	N/a	N/a	N/a	BREEAM building emission rate per annum.
Utilities Campus A:										
Electricity usage	UEO	kWh	894895	0.0005442	N/a	N/a	N/a	N/a	N/a	UK DEFRA (2009) conversion factor.
Gas usage	"	kWh	2099310	0.0002042	N/a	N/a	N/a	N/a	N/a	UK DEFRA (2009) conversion factor.
Water usage	"	m^3	14856	0.000276	N/a	N/a	N/a	N/a	N/a	UK DEFRA (2009) conversion factor.
Sewage produced	"	m^3	14856	0.000693	N/a	N/a	N/a	N/a	N/a	UK DEFRA (2009) conversion factor.
Transport:										
Campus C estimates:										
Staff transport	Survey	Multiple data sources and conversion factors used for staff and student transport.								
Student transport - part-time	Survey	Staff and student transport data gathered using small-scale surveys. Data gathered on: types of transport (car/other vehicle, public transport, part & ride);								
Student transport - full-time	BREEAM ass't	make and model of car (if applicable); number of journeys and length of journey.								
University park & ride	Estimates	Car emissions per Km obtained from UK Government Vehicle Certification Agency (2009); average emissions calculated based on all cars in survey.								
Campus A estimates:		Car emission data available for all pollutants listed above, with the exception of SO$_2$.								
Staff transport	Survey	Park & ride bus emissions conversion factor (CO$_2$ per passenger Km) taken from DEFRA (2009).								
Student transport - part-time	Survey	Public transport emissions conversion factor (CO$_2$ only) taken from BREEAM assessment (317.5Kg CO$_2$ p.a. per member of staff/per student)								
Student transport - full-time	BREEAM ass't									

Table B9 – Monetisation factors used

Log of damage costs used (application/source/author):									
					Damage costs:				
FCA application	**Author & date**	**Particulates**	**CO**	**NOx**	**THC**	**SO_2**	**CO_2**	**CH_4**	**N_2O**
		£/tonne	**£/tonne**	**£/tonne**	**£/tonne**	**£/tonne**	**£/tonne**	**£/tonne**	**£/tonne**
SAM NZ waste disposal Vs recovery	Cavanagh (LCR), 2005	47378.86	0.41	889.82	444.91	2227.08	10.28	215.93	3907.37
Australian forest management	Herbohn, 2005								
Refinement of natural gas	Antheaume, 2004								
AlcCo	Bent & Richardson, 2003			5000		5000	6		
Powergen - electricity generation	Atkinson, 2000	32150		240		485	12	80	
Other sources:									
CWRT (quoted in Forum SAG) per ton	CWRT, 1999			315.52		268.38			
ExternE Project (quoted in Forum SAG)	Date & author unknown	9707.45		7622.10		5095			
ORNL (quoted in Forum SAG)	ORNL, 1995	10533.73		632.56		305.85			
Tol (2008) - average of 211 SCC figures							63.47		
Largest figure in Tol (2008) analysis							1450.68		
Averages		24942.51	0.41	2450.00	444.91	2230.22		147.97	3907.37
Figures used for FCA calculations		**24942.51**	**0.41**	**2450.00**	**444.91**	**2230.22**	**63.47**		

Table B10 – Steel & concrete manufacture (cradle to gate) conversion factors available:

		Conversion factors:			
		CO_2 (or equiv.)	Particulates	NOx	SOx/SO_2
Steel manufacture (cradle to gate):	**Activity unit**	**t**	**t**	**t**	**t**
Hammond & Jones (2008):					
General steel:					
UK 'typical' (42.7% recycled content)	tonne	1.77			
Virgin	tonne	2.75			
Sustainable Concrete (2009) (industry association):					
Sustainable.concrete.org.uk; ECO2 and cons'n mat'ls table vsn 1.1:					
UK produced structural steel sections	tonne	1.932			
(sourced from Amato & Eaton, Steel Construction Institute, 1998)					
Worldsteel (2009) (industry association):					
Average figure	tonne	1.9			
Worldsteel fig used for FCA calculations	***tonne***	$\boxed{1.9}$			
Concrete production (cradle to gate):					
Sustainable Concrete (2009):					
Sustainable.concrete.org.uk; ECO2 and cons'n mat'ls table vsn 1.1:					
Embodied CO2 of concrete mixes (cradle to gate):					
A - Reinforced foundations	m^3	0.318			
B - Ground floors	m^3	0.315			
C - Structural: in situ floors, superstructure, walls, basements	m^3	0.372			
Reinforced foundations	tonne	0.132			
Ground floors	tonne	0.133			
Structural: in situ floors, superstructure, walls, basements	tonne	0.153			
Sustainableconcrete.org.uk; sheet C1 average figures:					
Reinforced concrete average	m^3	0.270			
Reinforced concrete average	tonne	0.115			
Hammond & Jones (2008):					
Did not give average or typical reinforced concrete figures;		-			
therefore could not find comparative figures to above.		-			
Used for FCA calculations - average of (A-C) above	m^3	$\boxed{0.335}$			
British Cement Association (2008) & Sustainable Concrete (2009):					
UK concrete (with or without reinforcement), data derived from BCA					
Performance Report and sustainableconcrete.org.uk info sheet C1	m^3				
Figures used for FCA calculations			***0.000033***	***0.00066***	***0.000273***
Explanation - non-carbon emission factors for concrete					
		Conversion to			
	*Kg/te/PCe**	*Kg/300kg cement***			
Dust (particulate) emissions to air	*0.11*	*0.033*			
NOX emissions to air	*2.2*	*0.66*			
SO_2 emissions to air	*0.91*	*0.273*			
** Kg per tonne of Portland cement manufactured, 2007. Source: BCA Performance Report, 2008*					
*** = amount of air pollutant per m^3 of concrete, given data in table 'quantities of raw materials per*					
m^3 of concrete' below (sourced from sustainableconcrete.org.uk info sheet C1 'embodied CO2 of concrete', 27/11/08)					
Quantities of raw materials per m^3 of concrete:					
	UK	*UK reinforced*			
	concrete:	*concrete:*			
	Kg/m^3	*Kg/m^3*			
Total cementitious content	*300*	*300*			
Water	*165*	*165*			
Aggregate	*1915*	*1915*			
Reinforcement	*0*	*110*			
	2380	*2490*			
Proportion of cement in each m^3 of concrete therefore:	*13%*	*12%*			

<u>Table B11</u> – Flooring conversion factors:

	Activity unit	CO_2 (t)
<u>Carpet</u>:		
Hacker et al (2008):		
Carpet 60 yrs domestic dwelling (see explanation of figure below)	m^2	**0.106**
Hammond & Jones (2008):		
General carpet (but not life cycle replacement - one carpeting only, cradle - grave)	m^2	**0.00976**
Hammond & Jones noted a shortage of quality data on carpets		
Figure used in FCA calculations		**0.106**
<u>Linoleum</u>:		
Hammond & Jones (2008):		
Embodied energy = 25MJ/Kg; 1.21 KG CO_2/Kg		
NB - figures represent one life cycle only - but Linoleum long-lived		
[Per Jonsson, Tillman & Svenson (1997), Linoleum embodied energy = 57.7MJ/m^2]		
Therefore conversion factor (to convert KG CO_2/Kg to Kg CO_2/m^2) = 57.7/25 = 2.308		
Linoleum Kg CO_2/m^2 = 2.308 x 1.21 = 2.79268	m^2	**0.00279**
NB - above figure used in FCA calculations		
<u>General rubber</u>:		
Hammond & Jones (2008):		
3.18 Kg CO_2/Kg (vs 3.89 Kg CO_2/Kg for general carpet; 9.76 Kg CO_2/m^2, carpet)		
Therefore assume Kg CO2/m2 for rubber = 9.76/3.89 x 3.18 =		**0.00798**
NB - above figure used in FCA calculations		
Explanation - Hacker et al carpet figure:		
Hacker et al 2008 – Embodied and Carbon Dioxide Emissions from Housing: a case study on the effects of thermal mass and climate change.		
Noted that initial purchasing and replacement of ground floor carpets per house over a 100 yr life cycle would emit 5.5 tonnes of CO_2.		
House modelled = 65m^2; therefore assume that ground floor = 32.5m^2.		
To achieve comparability with BRE Green Guide to Spec'n, need to pro-rata above to a 60-year cycle.		
Therefore, 60-year impact (in tonnes of CO_2) of carpeting 32.5 m^2 = 5.5/100 x 60 = 3.3 tonnes. Impact of carpeting 1m^2 over same period = 3.3/32.5 = 0.106 tonnes.		

<u>Table B12</u> – CO_2 impact figures derived from Hacker et al. (2008):

<u>Hacker et al (2008) cumulative CO_2 emissions (approx; reading off graph) for a two-bedroom starter home:</u>

	Start of simulation (reps. ECO_2 of materials used in build) year 2000:	CO_2 from use added to 'build' CO_2: 2010	2020	2030	Cum've 2030 excl. 2000-2010	2050
	t	t	t	t	t	t
Lightweight:	32.03	~45	~60	~80	~35	~120
Medium-weight:	**33.27 #**	~46	~60	~75	**~29 ##**	~105
Heavy:	36.96	~50	~60	~75	~25	~97

ECO_2 impact from building a medium-weight house = approx. 33.27 tonnes.

ECO_2 impact from 20-year use = approx. 29 tonnes.

ECO_2 from refurbishment of finishes, services, doors, carpets etc over 100 yr period excluded from figures above.

Refurbishment CO_2 impact quoted separately as 26 tonnes for a lightweight house and 19 tonnes for a heavyweight house.

Therefore assumed that a medium-weight house would generate 19+26/2 = 22.5 tonnes over 100-year lifetime; equates to 4.5 tonnes over 20 years.

Given the Hacker study figures, it was concluded that an average home might be double the size of a starter home, and that emissions for the build, maintenance and use might be double too. The following emissions figures were therefore derived for an average home:

	CO_2 (or equiv.)
	t
Per home built	66.54
Use of home (20 yrs)	58
Maintenance (20 yrs)	9
Comparison figure for a 100-year life cycle	401.54

<u>Table B13</u> – Total damage costs from transport emissions (Campus C vs Campus A), average social cost of carbon:

Impact caused by:	Campus C * £	Campus A # £
Staff transport	3,320,198	4,007,265
Student transport (part-time students)	3,898,530	3,921,378
Student transport (full-time students)	413,898	413,898
University park & ride	229,280	N/a
Total	**7,861,906**	**8,342,541**

* No differences between drafts 1&2; additional transport surveys were not undertaken due to uncertainties over available transport and parking arrangements at Campus C

\# Figures identical for 'eco-refurb' and 'no eco-refurb'

<u>Table B14</u> – Staff using/intending to use each transport option:

	Campus C:		Campus A:	
Transport option:	**Percentage using option:**	**Total staff using option:**	**Percentage using option:**	**Total staff using option:**
Drive	71	177	87	218
Use public transport	29	73	13	32
Use park & ride scheme	0	0	N/a	N/a

<u>Table B15</u> – Average distances travelled:

Average distance travelled (Km) (per staff survey):		
Campus A	**Campus C**	**park & ride point**
23.92	24.32	27.11

<u>Table B16</u> – Total life-cycle emissions and damage costs, Campus C:

	Total LC emissions (tonnes) per type of journey:				
Type of emission:	**A Car**	**B Car (to park & ride)**	**C Public Transport**	**TOTAL LC emissions, all journey types (tonnes)**	**Total damage costs £**
CO_2	48,520	0	465	48,985	3,108,910
CO	125	0	N/a	125	51
HC	15	0	N/a	15	6,501
NO_X	17	0	N/a	17	40,532
SO_2	0	0	N/a	0	0
Particulates	7	0	N/a	7	164,204
					3,320,198

Table B17 – Total life-cycle emissions and damage costs, Campus A:

Type of emission:	Total LC emissions (tonnes) per type of journey: A Car	B Public Transport	TOTAL LC emissions, all journey types (tonnes)	Total damage costs £
CO_2	58,896	202	59,098	3,750,791
CO	151	N/a	151	62
HC	18	N/a	18	7,892
NO_X	20	N/a	20	49,200
SO_2	0	N/a	0	0
Particulates	8	N/a	8	199,320
				4,007,265

Table B18 – Students using/intending to use each transport option:

	Campus C:		Campus A:	
Transport option:	**Percentage using option:**	**Total students using option:**	**Percentage using option:**	**Total students using option:**
Car	59	787	78	1025
Motorcycle	3	36	0	0
Car-share	5	72	10	132
Use public transport	14	179	10	132
Use park & ride scheme	11	143	0	0
Walk/cycle	8	107	3	33
Average number of part-time student attendances p.a. :				
		40		

Table B19 – Average distances travelled:

Average distance travelled (Km) (per student survey):		
Campus A	**Campus C**	**park & ride point**
21.62	23.09	26.33

Table B20 – Total life-cycle emissions and damage costs, Campus C:

Type of emission:	Total LC emissions (tonnes) per type of journey: A Car	B Car (to park & ride)	C Public Transport	D Motor cycle	TOTAL LC emissions, all journey types (tonnes)	Total damage costs £
CO_2	45,733	9,481	1,135	1,519	56,349	3,576,319
CO	125	26	N/a	N/a	152	62
HC	22	5	N/a	N/a	26	11,695
NO_X	32	7	N/a	N/a	38	93,704
SO_2	0	0	N/a	N/a	0	0
Particulates	7	1	N/a	N/a	9	216,750
						3,898,530

Table B21 – **Total life-cycle emissions and damage costs, Campus A:**

Type of emission:	Total LC emissions (tonnes) per type of journey: A Car	B Public Transport	TOTAL LC emissions, all journey types (tonnes)	Total damage costs £
CO_2	55,814	840	56,654	3,595,666
CO	153	N/a	153	62
HC	27	N/a	27	11,822
NO_X	39	N/a	39	94,723
SO_2	0	N/a	0	0
Particulates	9	N/a	9	219,105
				3,921,378

<u>Table B22</u> – Projected no. of crimes committed against Campus C staff/students and associated damage costs

	Crime per 1,000 population in City	Probability of crime/person %	Total staff & students at Campus C	Average no. affected by crime
Crime in City by type*:				
Violence against the person	24.4	2.44	2600	63.44
Sexual offences	1.4	0.14	2600	3.64
Robbery offences	1.0	0.1	2600	2.6
Theft of a motor vehicle	3.9	0.39	2600	10.14
Theft from a vehicle	11.7	1.17	2600	30.42

* Per Home Office stats 08/09

Average costs/person of consequences of crime:								
Value of property stolen £	Property damaged/ destroyed £	Property recovered £	Victim services £	Lost output £	Health services £	Crime against staff & students - total cost per annum £	Period assessed (yrs)	Crime against staff & students - total cost £
			-9	-1648	-1347	-190573.76	20	
			-32	-4430	-916	-19575.92	20	
-109	-12	19	-16	-1011	-483	-4191.2	20	
-2367	-349	542	-1	-47	0	-22531.08	20	
-240	-126	11	-1	-20	0	-11437.92	20	
						-248309.88	20	**-4966197.6**

Table B23 – **Trend analysis of income and expenditure (source: University financial statements & financial projections).**

	Income (excl. endow't & interest) £	% inc/dec	Staff costs £	% inc/dec	Other op. expenses £	% inc/dec
2005 actual	33,303,000		20,833,000		10,762,000	
2006 actual	35,500,000	6.6	22,318,000	7.1	10,913,000	1.4
2007 actual	38,726,000	9.1	23,259,000	4.2	11,735,000	7.5
2008 actual	42,038,000	8.6	25,877,000	11.3	12,855,000	9.5
2009 forecast	44,219,000	5.2	27,007,000	4.4	14,651,000	14.0
2010 forecast	45,540,000	3.0	27,612,000	2.2	15,328,000	4.6
2011 forecast	47,996,000	5.4	28,331,000	2.6	15,323,000	-0.03
2012 forecast	49,805,000	3.8	29,592,000	4.5	16,076,000	4.9
Av. inc/dec.		**5.9**		**5.2**		**6.0**

APPENDIX C – CONFIDENTIALITY AGREEMENTS

CARDIFF BUSINESS SCHOOL[145]
RESEARCH ETHICS

Consent Form – institution level

Project:
Full Cost Accounting (FCA) methodologies as a measure of sustainable development for higher education projects: development, use and impact

I understand that this project will involve University X participating in a Full Cost Accounting (FCA) case study conducted by Jared Davies (University X employee and PhD researcher at Cardiff Business School), relating to Campus C.

I understand that Jared Davies will gather data on the Campus C project and its economic, resource, environmental and social impacts, based on a preliminary analysis. The data will be gathered from University systems, employees and students, and the building contractors and professional advisors engaged by the University on the project. Jared Davies will then convert the impact data into monetary amounts, and hence will calculate the 'full' costs and benefits of the project. (The 'sustainability opportunity cost' of moving from existing sites will also be calculated). The 'full cost' calculations may pass through a number of iterations.

I understand that some data may be gathered using 'green questionnaire sheets'.

I understand that interviews with key University staff* (plus contractors and consultants) will be undertaken at various stages of the project. In addition to facilitating the gathering of data, the interviews will allow Jared Davies to:

- gauge initial attitudes of staff to sustainability and FCA;
- refine initial FCA calculations based on feedback; and
- gauge whether the FCA process and numbers calculated alter attitudes in any way towards sustainability and FCA.

* *'key staff' may include the University managers in charge of the project at directorate level, other key members of the University directorate such as the vice chancellor and the director of finance, and the University environmental offer and estates staff*

I understand that all University staff, contractors and consultants interviewed will be given a copy of this signed consent form prior to interviews taking place (to give them the authority to disclose information), and that they will also sign individual consent forms. University students who contribute data will be given separate individual consent forms.

I understand that Jared Davies may request to observe meetings that will discuss Campus C during the course of this project.

I understand that Jared Davies may request to present his FCA data to internal University meetings and workshops (for example, meetings of the University Board of Governors).

[145] When the fieldwork was commenced, this author was undertaking PhD studies at Cardiff Business School. A transfer to Kings College occurred due to Professor Solomon moving to Kings.

I understand that participation by the University in this study is entirely voluntary and the University can withdraw from the study at any time without giving a reason.
I understand that the University is free to ask any questions at any time, and to discuss any concerns with Dr Jill Solomon (supervisor of the PhD project).

I also understand that at the end of the study the University will be provided with additional information and feedback about the study.

I, ___________________________________(*NAME*) consent for University X to participate in the study conducted by Jared Davies of University X (PhD student of Cardiff Business School, Cardiff University) with the supervision of Dr Jill Solomon.

I, ___________________________________(*NAME*) agree (on behalf of the University) that the University will allow its employees and contractors/consultants to release data to Jared Davies on Campus C, and to in engage in interviews with Jared Davies to discuss Campus C, FCA and sustainability.

I, ___________________________________(*NAME*) wish (on behalf of the University) that all references to the University are removed in the author's thesis and/or subsequent publications (for example, the University will always be referred to as 'University X'), and that any monetary data published is not attributed to the University. Further, I wish that where the author feels that any monetary data is price-sensitive and/or may lead to commercial confidentiality issues, it is discussed with the University prior to publication (and the University reserves the right for such data to be treated confidentially and not published in any format)[#].

[#] ***I understand that if it is requested that information provided by the University will be held confidentially, then only Jared Davies will be able to trace this information back to the University. The information will be retained for up to seven years, after which it will be deleted/destroyed. I understand that the University can ask for the information to be deleted/destroyed at any time and, in accordance with the Data Protection Act, the University can have access to the information at any time.***

Signed:

Date:

CARDIFF BUSINESS SCHOOL
RESEARCH ETHICS

Consent Form – individual interviewees/project group participants (employees, contractors, advisors)

<u>Project</u>:
Full Cost Accounting (FCA) methodologies as a measure of sustainable development for higher education projects: development, use and impact

NB – this consent form should be read in conjunction with the institution approval form signed by the University of Wales, Newport

I understand that my participation in this project will involve engaging in interviews and/or project groups with Jared Davies (University X employee and PhD researcher) regarding the application of FCA techniques to assess the sustainability of the University X Campus C project.

I understand that participation in this study is entirely voluntary and that I can withdraw from the study at any time without giving a reason.

I understand that I am free to ask any questions at any time. If for any reason I experience discomfort during participation in this project, I am free to withdraw or discuss my concerns with Dr Jill Solomon (supervisor of PhD project).

I also understand that at the end of this phase of the study I will be provided with additional information and feedback about the study.

I also agree to the following (please tick as appropriate):

	Tick
I agree for my name and discussion answers to be quoted in the thesis published by Jared Davies; OR	
I agree for my answers to be quoted but I wish to remain anonymous; OR	
I wish for all answers given to be treated confidentially* and not to be quoted directly in the thesis; OR	
I request to see a copy of all interview transcript(s), in order to agree elements in answers that should remain confidential* and/or anonymous. I will inform Jared Davies in writing of these elements and will expect a confirmation of these matters from him.	

* I understand that if it is requested that information provided by me will be held confidentially, then only Jared Davies will be able to trace this information back to me individually. The information will be retained for up to seven years, after which it will be deleted/destroyed. I understand that I can ask for the information I provide to be deleted/destroyed at any time and, in accordance with the Data Protection Act, I can have access to the information at any time.

I, ___________________________________(*NAME*) consent to participate in the study conducted by Jared Davies of University X (PhD student of Cardiff Business School, Cardiff University) with the supervision of Dr Jill Solomon.

Signed: **Date:**

ESRC Research Project - DATA MANAGEMENT AND CONSENT FORM

NAME: **ADDRESS: University X** **TOWN/CITY:** **POSTCODE:** **TELEPHONE (optional):** **E-MAIL ADDRESS (optional):** **Interview number/date:** **Tape/disc number:**
I hereby agree to take part in the ESRC BRASS Centre's research project: "Full Cost Accounting (FCA) methodologies as a measure of sustainable development for higher education projects: development, use and impact" Signed: ……………………………………………….
The information that I am about to pass on to BRASS is: □ Non-confidential □ Confidential (please refer to Cardiff Business School consent and confidentiality agreement above)
I hereby give permission to BRASS to use the information I am about to pass on in connection with this research in the following ways (please tick one or more options shown below): □ use the data from this interview in aggregated, anonymous form for the above mentioned project; □ use captions/quotes from the interview transcription to feature in the project's written output; □ use the data from this interview for secondary analysis by BRASS; □ use the data from this interview for secondary analysis by OTHERS (external to BRASS); □ submit data from this interview in an anonymous from to the ESRC/UK Data Archive; and/or □ enter my contact details into the ESRC BRASS Contacts Database (for use in BRASS mailings, invitations and other communications).

The ESRC BRASS Centre is committed to conducting research in an ethically approved manner. All our projects are checked by internal ethics committees. In agreeing to take part in the research, the BRASS staff member would like you to acknowledge that:

‘I understand what is expected of my participation in this project’.
‘I understand that it is entirely voluntary and that I can withdraw from the study at any time without giving a reason’.
‘I understand that I am free to ask any questions at any time’.
‘I understand that the information provided by me will be held anonymously’.
‘I understand that, in accordance with the Data Protection Act, this information may be retained indefinitely’.

Signed: ………………………………………
Date: ………………………

CARDIFF BUSINESS SCHOOL
RESEARCH ETHICS

Consent Form – data obtained from students

Project:
Full Cost Accounting (FCA) methodologies as a measure of sustainable development for higher education projects: development, use and impact

I understand that my participation in this project will involve providing data to Jared Davies (University X employee and PhD researcher) that will be fed into FCA models to assess the sustainability of higher education institutions.

I understand that participation in this study is entirely voluntary and that I can withdraw from the study at any time without giving a reason.

I understand that I am free to ask any questions at any time. If for any reason I experience discomfort during participation in this project, I am free to withdraw or discuss my concerns with Dr Jill Solomon (supervisor of PhD project).

I understand that the information provided by me will be held confidentially, such that only Jared Davies can trace this information back to me individually. The information will be retained for up to seven years, when it will be deleted/destroyed. I understand that I can ask for the information I provide to be deleted/destroyed at any time and, in accordance with the Data Protection Act, I can have access to the information at any time.

I also understand that at the end of the study I will be provided with additional information and feedback about the purpose of the study.

I, ___________________________________(*NAME*) consent to participate in the study conducted by Jared Davies of University X (PhD student of Cardiff Business School, Cardiff University) with the supervision of Dr Jill Solomon.

Signed:

Date:

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